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Crocodilian Nomenclature

By LEONHARD STEJNEGER

FOLLOWING certain nomenclatorial hints in an article by Lorenz Müller (1924: 320) Dr. Franz Werner in a recent paper in the *Zoologischer Anzeiger* (1933: 106) announces that in strict application of the law of priority and much against his own sentiment (*Gefühl*) he proposes to replace the old generic name *Crocodilus* by *Champse* Wagl.[1] and to apply the name *Crocodylus* Laurenti to the caimans of genus *Palaeosuchus*.

Such a transfer, if necessary under the International Code of Zoological Nomenclature, would be nothing less than catastrophic. Fortunately, however, it has become unnecessary by the timely type designation in 1917, seven years before Müller's article in 1924. Owing to the lengthy argumentation of the latter it becomes necessary to discuss the status of Laurenti's genus in considerable detail.

By the Opinion 89 of the International Commission on Zoological Nomenclature, the generic names proposed by Gronovius in his Zoophylacium, 1763, have become unavailable. Consequently his generic name *Crocodylus* has no status and does not invalidate the use of the name by Laurenti in 1768 (p. 53).

In this genus he included four species, as follows:

p. 53. *Crocodylus niloticus*
p. 54. *Crocodylus americanus*
Crocodylus africanus
Crocodylus terrestris

From one of the species embraced by these four names the type of the genus *Crocodylus* must be chosen. It is therefore necessary first to ascertain the status of these four names.

It should be noted at once that while it may be true that the author of Laurenti's *Synopsis* did not base his names on any specimens available to him for description, he was not dependent for his knowledge of the genus solely on the text and illustrations in Seba's *Thesaurus,* which he quotes, a fact which is plainly demonstrated by the generic diagnosis which is not derived from Seba's text.

However, in Seba's figures he evidently thought he recognized four species, in contradistinction to Linnaeus who had lumped nearly all crocodilians under the one composite species *Lacerta crocodilus*. According to the general plan of the book, to each of the four trivial names he added, by way of illustration, a reference to those figures in Seba, which he regarded as belonging to it. An analysis of his treatment will show that each one of his identifiable names is composite, and that none of them can be vindicated as unquestionably applicable to one species only. As attempts have been made from time to time to SUBSTITUTE these names for species long familiar under other names of unquestionable applicability, it must be proved beyond any doubt that the Laurentian names are of such pertinence that their adoption becomes compulsory under the

[1] Probably meant for *Champse* Merrem, 1820, as *Champsa* Wagler, 1830, belongs to the alligators.

Code. It is not permissible to substitute one uncertainty for another uncertainty, much less an uncertainty for an established certainty.

Crocodylus niloticus.—Schneider (Hist. Amph., 2, 1801) seems to be the first author to seriously analyze Laurenti's species. On p. 135 he mentions that Laurenti called the first one *C. niloticus,* that it occurs both in the East Indies and in Egypt, and that he matched it with Seba's pl. 105, figs. 3 and 4. After reprinting Laurenti's Latin diagnosis he adds (p. 136) "Hanc forte solam Laurentius viderat; reliquas tres certe ex picturis Sebanis effinxisse videtur." (This is probably the only one seen by Laurenti; the other three he seems to have fashioned from Seba's pictures.) Cuvier (1807: 36) holds a similar opinion, saying "Laurenti fait de préference de cette figure 3, planche 105 [Cuvier does not mention fig. 4 at all] l'image de son crocodile du Nil, et assurément sans qu'on puisse savoir pourquoi." It is generally conceded that Seba's pl. 105, fig. 3, may be a picture of the species subsequently called *Crocodilus trigonatus* by Schneider (1801), and Cuvier even believes that the specimen of the latter species in the Paris Museum is the original of Seba's picture (1807: 35–36). But Laurenti's diagnosis and his inclusion of the Nile crocodile together with the added habitat of Egypt, has convinced subsequent writers, for instance Boulenger (1889), that Laurenti's name *niloticus* covers a composite species concept, viz. the true Nile crocodile plus the *Caiman trigonatus* which he thought came from the Orient. This composite nature of *Crocodylus niloticus* is augmented by the consideration of Seba's fig. 4, pl. 105. Supposing that figure 3 may be interpreted as representing *C. trigonatus,* there is no assurance that fig. 4 represents the same species, though it is currently taken for granted. It is a picture of the underside of some young crocodiline specimen, which shows no characters by which it can be positively identified. On the contrary, a comparison of the tails of the two figures lends force to the contention that they represent two species.

In opposition to this interpretation of Laurenti's *C. niloticus* as the name of a species concept composed of two or possibly three elements, Lorenz Müller (1924: 318) contends that Laurenti's nomenclature is based exclusively on Seba's illustration, arguing that Laurenti as a basis for his diagnosis had no other source than Seba's work. His elaborate explanation of how Laurenti came to use the word *cataphractus* is ingenious, and may be true, but neither that argument nor the one derived from the fact that the description of the claws and toes fits the two Seba figures is sufficiently compelling to offset the other considerations which Müller does not touch upon.

Crocodylus americanus (Laurenti: 54) appears to be based exclusively on Seba's plate 106. It is generally admitted that this celebrated picture is entirely unidentifiable, and that it was a mistake of Gray (1844: 60), Günther (1885) and Boulenger (1889) to revive it and substitute it for Cuvier's unequivocal *C. acutus.*

Crocodylus africanus (Laurenti: 54) is not only unidentifiable, but is complex in addition. It is based on Seba, pl. 103, figs. 2, 3 and 4, of which fig. 2 is no crocodile at all, but some lizard, as shown by its feet,

and 3 and 4 represent some species of a crocodilid which nobody has ventured to identify.

Crocodylus terrestris (Laurenti: 54) is equally uncertain and composite, referring as it does to Seba's pl. 103, fig. 1 and all the figures on plate 104. These figures represent at least three different species. The first-mentioned, according to Cuvier, is a *Crocodilus biporcatus* (=*porosus*), a certain identification as Seba's specimen is in the Paris Museum. Figures 1–9 of plate 104, represents a series of young of *C. acutus* in various stages of leaving the egg, an identification equally authentic, as Cuvier had three of the originals, and Duméril and Bibron (Erp. Gén., 3: 124) have recorded that two of them were still in the Paris Museum in 1836. Figure 10 was identified in 1901 by Schneider (p. 163) as a good likeness of *C. sclerops*. Figure 11 is unidentifiable, and Cuvier (1807: 50) regarded figure 12 as *C. porosus*, while Duméril and Bibron (1836: 124) think it "n'est pas douteux" that it represents a *C. acutus*.

Laurenti's four names consequently represent a number of species as follows:

C. niloticus: *Caiman trigonatus* (Schneider, 1801).
An unidentified crocodilian.
Crocodilus vulgaris Cuvier (1807).

C. americanus: An unidentifiable crocodile.

C. africanus: An unidentifiable lizard.
One or more unidentifiable crocodilians.

C. terrestris: *Crocodilus porosus* Schneider (1801).
Crocodilus acutus Cuvier (1807).
Caiman sclerops (Schneider, 1801).
An unidentifiable crocodilian.

In ascertaining the type of Laurenti's genus *Crocodylus*, the search is restricted by Article 30 of the International Code to one of the species originally included. The question first raised is whether the case is one involving acceptance solely upon the basis of the original publication. Plainly the case of *Crocodylus* is not one of original designation, nor one in which the word *typicus* or *typus* is used as a new specific name, nor a case of a genus with a single original species.

The question next arises whether the case is one to which the following rule applies (Art. 30, I, d): "if a genus . . . . contains among its original species one possessing the generic name as its specific or subspecific name, either as valid name or synonym, that species or subspecies becomes *ipso facto* type of the genus." True, Laurenti does not make any direct reference to *crocodilus* as a specific name. Nevertheless, his *C. niloticus* is a composite name which in part includes "*the* crocodile" or *crocodilus* in a specific sense, and may thus be said to "possess" it as a synonym[2] at least in part.

[2] Tout le monde sait que le nom de *crocodile* appartient originairement à l'espèce du Nil." (Cuvier, 1807: 27). Cuvier avoided the "tautonymy" which would result from elevating the specific name *crocodilus* to a generic one, by changing it to *vulgaris*. He thereby plainly recognized the principle and at the same time practically achieved type designation by characterizing his "crocodile vulgaire d'Egypte (*crocodilus vulgaris*, Nob.), afin d'en faire mon point de départ," explaining in a footnote that "je suis ici l'exemple des botanistes, qui laissent ordinairement le nom trivial de *vulgaire* aux espèces qui portaient autrefois en propre un *nom* devenue générique." (Op. cit.: 40.)

Linnaeus' *Lacerta crocodilus* of 1758, though not actually mentioned, is certainly included in several of Laurenti's species of *Crocodylus* of 1768, and has to be taken into account when ascertaining the genotype of the latter. But in as much as both Linnaeus' and Laurenti's species are composites it is important to note that Linnaeus' *L. crocodylus* embraces all the then known crocodilians with the notable exception of *C. trigonatus* by apparently purposely omitting reference to Seba's plate 105, fig. 3, which constitutes part of the complex Laurentian *C. niloticus*.

Realizing that the application of the principle of tautonymy might be challenged, Stejneger and Barbour in the first edition (1917) of their *Check List of North American Amphibians and Reptiles*, p. 41, reinforced the claim of the true Nile crocodile, *the* crocodile, to be the genotype of *Crocodylus* by subsequent designation as follows: "Type: *niloticus* = *Lacerta crocodilus* Linné in part." Obviously this "part" could not be the *Caiman trigonatus*, Seba's plate 105, fig. 3, which was not included by Linnaeus, nor the specimens described by him in the Museum Adolphi Frederici, which were *Caiman sclerops*, but only that part which referred to the crocodile of the Nile.

Thus was anticipated and obviated the subsequent "nomenclatorial sketch" by Müller (Zool. Anz., 58, 1924: 320) which intimated that the generic name *Crocodylus* Laurenti might eventually have to be applied to the "Glattkopf-kaiman," *C. trigonatus*, because of his interpretation of the *C. niloticus* from India and Egypt as being based exclusively on Seba's figures, a transfer of names which would "clearly result in greater confusion than uniformity."

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U. S. National Museum, Washington, D. C.

A New Salamander from the Ouachita Mountains

By E. R. Dunn and Albert A. Heinze

On the first of May, 1933, Mr. L. Hubricht collected on Rich Mt., east of Page, Le Flore Co., Oklahoma. His collection contained a redbacked specimen of *Plethodon cinereus,* a specimen of *Plethodon glutinosus,* and five specimens of an undescribed *Plethodon,* thus adding three species to the fauna of Oklahoma. On May thirtieth, the junior author and Miss Dorothy A. Boyer collected four additional specimens of the new form in the Ouachita National Forest on Rich Mt. in Polk Co., Arkansas, about nine miles east of Hubricht's locality. Both sites are on the northern side of the mountain.

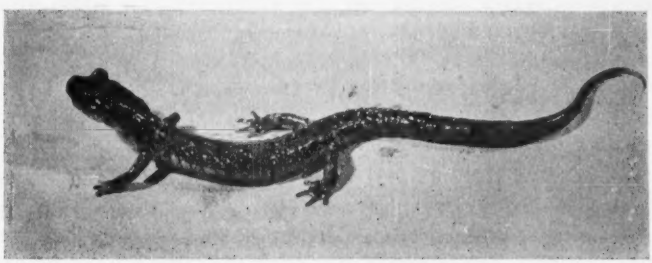
The *Plethodon* may be termed

Plethodon **ouachitae,** sp. nov.

Diagnosis.—A medium-sized *Plethodon* with 15–17 costal grooves; vomerine teeth 7–9 in series; throat white; white spotting largely concentrated on sides; dorsum with more or less chestnut red concealing the black (in life).

Type.—Adult male, collected by A. A. Heinze and Dorothy A. Boyer, to be deposited in U. S. National Museum.

Type locality.—Ouachita National Forest, on Rich Mt., Polk Co., Arkansas.



An Oklahoma specimen of *Plethodon ouachitae*

Description.—The costal grooves are 15 in one specimen, 17 in one, and 16 in six; the appressed toes are separated by 4 costal folds in one specimen, by 2 in three, by 1–2 in one, and by 1 in three. This is correlated with both age and sex, the legs being relatively longer in the smaller individuals and the males, and relatively shorter in adults and in females. The reddish dorsal band is most marked in the younger specimens. The vomerine teeth begin behind the outer border of the choanae, and are well separated from each other in the median line.

Measurements:

sex	total	head	body	tail	costal grooves	c. folds bet. toes	
female	91	15	56	20	17	4	Oklahoma
"	110	12	42	56	16	2	Arkansas
"	106	13	40	53	16	2	Arkansas
"	97	11	37	50	16	1	Oklahoma
male	111	14	43	54	15	2	Arkansas
"	107	13	41	53	16	2	Arkansas TYPE
"	95	12	41	42	16	1	Oklahoma
"	71	11	41	19	16	1–2	Oklahoma

Remarks.—This species is closely allied to *Plethodon wehrlei* of the Appalachian Plateau in New York, Pennsylvania and West Virginia, and to *Plethodon yonahlossee* of the Southern Blue Ridge in Virginia and North Carolina. It is more like *yonahlossee* in coloration, and more like *wehrlei* in dentition and in proportions. It is extremely interesting to find another Appalachian type in this isolated mountain region, and bespeaks a quite respectable age for the *yonahlossee-wehrlei-ouachitae* group.

In habits no essential difference has been noted from others of the genus. The Arkansas specimens were obtained about two-thirds the way up the mountain, near the junction of a road to the top, and a road leading to an observation tower of the park service. The locality is a moist, densely shaded, rocky ravine of northern exposure. The crested dwarf iris, *Iris cristata* Ait., grows in profusion in the rich sandy loam of the mountain side.

Many of the specimens were heavily infested with mites under the epidermis.

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A Quantative Study of Food of Some Brown-shouldered Lizards

By SHERWIN F. WOOD

THE apparent ease with which some species of lizards adapt themselves to captivity suggested this experiment. With the aid of my young sisters, Jane and Phyllis Wood, a number of brown-shouldered lizards (*Uta*) were kept alive from August 17, 1930, to August 17, 1931, and an accurate record of their food consumption was obtained.

The cage consisted of a screened box 3×3×3½ feet propped up on sticks about 4 feet from the ground. The bottom was filled with about 3 inches of fine sand. Scattered about in the sand were 7 or 8 small rocks on which the lizards sunned themselves, and 2 tin cans, with both ends cut out, in which they could hide. The cage was under the loose cover of a large rose bush but parts of it were exposed to direct sunlight throughout the day.

On August 17, 1930, 4 *Uta stansburiana hesperis* Richardson and 4 *Uta stansburiana elegans* Baird and Girard, all collected from Verdugo

Woodlands, Glendale, were placed in the cage. On September 22, 1930, another *Uta stansburiana hesperis* was put in, making 9 in all. On each of the following days, October 15, 1930, May 14, 1931, and May 22, 1931, a lizard died, leaving a total of 6, which group remained alive until August 17, 1931, in Los Angeles and until December 19, 1931, in the laboratory at Berkeley. The survivors were 4 *Uta stansburiana hesperis* and 2 *Uta stansburiana elegans*.

Feeding was done in the following way. Flies were caught in numbers by placing wide-mouth jars over masses congregated upon pieces of decaying meat previously placed about the yard. The bottle was then transferred to the opening of a small flap door in the center of the screen top of the cage. By tapping, the flies were thrown into the cage. Many butterflies and grasshoppers were caught by this method, while beetles and other insects were caught by hand. Meal worms were used when flies were not available. The number of insects put into the cage was recorded daily. A full dish of water was kept in the cage throughout the year.

The number of insects offered per month is as follows:

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.—Totals
Flies	—18	0	80	410	690	680	1226	1828	1274	846	202	85—7,339
Meal Worms	—50	24	47								39	41— 201
Sow bugs	— 1					·				15	55	— 71
Beetles	— 6					20					19	— 45

On the basis of the weight of 10 flies (adults) and 10 meal worms (large larvae) chosen at random, 6.6 flies equal one meal worm. Converting the figures for meal worms into their fly equivalents, we have J.—330, F.—158, M.—310, N.—257, and D.—270.

The months of July, August, and September show a total of 4,328 flies or about half the total for the whole year, giving an average of 6.4 flies per lizard per day. The greatest number of flies offered the lizards in one day was on September 4, 1930, a rather hot day, when 258 were put into the cage, about 28 flies per lizard. However, not more than 200 were eaten that day. During July and August, 1931, the lizards looked rather emaciated and were somewhat underfed as shown by comparison with specimens collected at this time of year in the field from the same locality.

From the above figures, including the meal worm fly equivalents, the food consumption for the year totals 8,780 insects, most of which consisted of flies. Most of these flies were blue bottles (*Calliphora* sp.) or green bottles (*Lucilia* sp.), although house flies, blow flies, and flesh flies were also caught. Of the other insects, meal worms (*Tenebrio* sp.) formed the largest part. Most of the beetles were carabid beetles. These figures represent the minimum number of insects because in the early part of the experiment, butterflies and spiders were put into the cage and not recorded. Besides, there was no check upon the many little friends who became intensely interested in feeding these lizards for a day and then, as the novelty of the experience wore off, forgot them. This later necessitated padlocking the cage after learning one day that some overenthusiastic youngster had tried to catch lizards instead of flies and had let all the animals out of the cage. However, all the lizards were recaptured.

A graph of the food consumed for the year plotted upon the same

scale as for a graph of the maximum and minimum temperatures of the same year gives us some idea of the effect of the environment upon the amount of food needed by the *Uta*. In this case, it shows there is a gradual increase in food consumed, closely paralleling the minimum temperature curve from February to July. The food curve then jumps to a maximum in August just after the peak of the maximum temperature curve which came in July. The food curve then rapidly falls until in November, December, and January it more closely approximates the minimum temperature curve.

These lizards drink and eat readily in captivity during the warm hours of the day, when they are most active. They snap up flies quickly and seem fond of meal worms. Small butterflies, commonly called "skippers," are readily taken and often-times before the insect finds its way into the cage, a watchful *Uta* will climb up the side of the cage and crawl into the bottle after it. All the flies put into the cage in one day were not consumed that day because the lizards would eat 7 or 8 and then pay no attention to the others. During the winter rains, they would remain buried in the wet sand or cling to the side of the cage. Seldom were they out during this period and they were fed only on sunny days after they were uncovered.

The *Uta* seems to be a definitely localized lizard as concerns habitat. This was shown when my experimental specimens were let out, since they were all found on the fence, on stones, or under boards near the cage. In repeated visits to the same locality in the field, certain lizards (previously noted by size or loss of tail) have been seen on the same rocks or along the same washes.

During the experiment, one of the *Uta stansburiana elegans* lost most of its tail when a cat tried to catch it through the wire screen of the cage. Successive measurements of the lizard from December 20, 1930, to May 14, 1931, a 145 day period, showed a new tail growth of 23 mm. or a growth rate of over 0.15 mm. per day.

In May 1931, all of the lizards were found heavily infested with mites. Over 25 adult mites were counted on one specimen and there were easily over 100 larvae on its abdomen as shown by the numerous bright red extremities of the young mites sticking out between the scales. They were found under the fold of the skin on the side of the neck just back of the tympanic cavity, in the fore and hind limb pits, along the skin in the angles between the fore and hind leg joints, on both the upper and lower eyelids, and scattered over the belly. Sometimes one eye was completely closed due to the presence of 3 or 4 large adult mites along the eyelid. As many mites as possible were scraped off and each animal, as well as the cage floor, was heavily sulphured. This did not rid the lizards of these pests but reduced the number greatly. This heavy ectoparasitic infection plus insufficient food supply probably accounted chiefly for their emaciation.

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Amphibians and Reptiles of Whitman County, Washington

By Arthur Svihla and Ruth Dowell Svihla

As time and opportunity have permitted, the authors have collected amphibians and reptiles in Whitman County, Washington, for the past two years. The resulting specimens, together with those already in the Charles R. Conner Museum collections in the State College of Washington at Pullman, comprise a list which forms the basis for this paper.

Dice,[1] in his "Distribution of the Land Vertebrates of Southeastern Washington," included the amphibians and reptiles of Walla Walla and Columbia counties, which lie southwest of Whitman County and south of the Snake River. Blanchard[2] reported on a collection of amphibians and reptiles from Stevens County, which bounds Whitman County on the north. Thus Whitman County forms a connecting link between these two areas where previous collecting has been done.

The following table shows this distributional relationship in concise form:

Amphibians	Dice Walla Walla and Columbia Counties	Svihla Whitman County	Blanchard Stevens Co.
Ambystoma macrodactylum	(*Aneides iecanus*)	———	———
Dicamptodon ensatus		———	
Rana pipiens	*R. p. brachycephala*		
Rana p. pretiosa	———	———	
Rana catesbeiana		———	———
Scaphiopus hammondii	———	———	
Bufo b. boreas	———	———	———
Hyla regilla	———	———	———
Reptiles			
Sceloporus gracilis	———		
Phrynosoma d. douglassii	———	———	———
Eumeces skiltonianus		———	
Charina bottae	———	———	
Diadophis amabilis occidentalis		———	
Coluber constrictor mormon	*C. c. vetustum*	———	*C. c. flaviventris*
Pituophis catenifer deserticola		———	
Pituophis catenifer catenifer	———		
Thamnophis sirtalis concinnus		———	*T. o. parietalis*
Thamnophis ordinoides vagrans	*T. o. elegans*	———	*T. o. elegans*
Crotalus c. oreganus	*C. oregonus*	———	*C. oregonus*
Chrysemys bellii bellii	*C. m. bellii*	———	*C. m. bellii*

Whitman County lies in the southeastern part of Washington just north of the Snake River and west of the Idaho state line. By far the greater part of the county is formed by the Palouse Hills, which were originally

[1] Univ. Calif. Publ., (Zool.) 16, 1916: 24–26.
[2] Copeia, Jan., 1921: 5–6.

covered with bunch grass but are now given over almost entirely to the raising of wheat. In fact this region is one of the "bread-baskets" of the world. To the south, along the Snake River canyon and along the western edge of the county where the rainfall gradually decreases, bunch grass gives way to sagebrush, which extends east from the Columbia River basin. In the northern and eastern parts of the county, conifers, chiefly western yellow pines, extend down from the foothills of the Idaho mountains along the water courses and often cap the tops of some of the higher buttes. Hence, within the county there are three types of vegetation which may be designated as (1) original bunch grass, now wheat land; (2) Columbia River basin sagebrush; and (3) foothill conifer.

Amphibians

1. *Ambystoma macrodactylum* Baird: long-toed salamander.—This is the common salamander of the wheat land region and has been collected frequently in the vicinity of Pullman. As early as February 15, 1931, a live specimen was taken in Pullman from under a fallen fence post. The ground was still frozen and patches of snow covered the hillsides, yet the salamander was quite active. Egg masses of the long-toed salamander were collected from a roadside pool near Pullman on April 12, 1931. They were brought into the laboratory and the following day they hatched. Three adult specimens have also been collected from Kamiak Butte.

2. *Dicamptodon ensatus* (Eschscholtz): marbled salamander.—Two specimens of the marbled salamander are in the collections of the Charles R. Conner Museum, one from Pullman (Svihla, 1931) and one from Albion, which is a country town 10 miles northeast of Pullman. These are the easternmost records for the state.

3. *Rana pretiosa pretiosa* (Baird and Girard): western spotted frog.—The western spotted frog is the most common frog found along the water courses of this region. It is particularly abundant in the spring when the streams overflow and there are numerous pools in the meadows and along the roadsides. Egg masses are common in these pools around Pullman in April. One frog was taken alive and active from a spring as early as January 20, 1931.

4. *Rana catesbeiana* Shaw: eastern bull frog.—The eastern bull frog has evidently been introduced by prospective frog-farmers and has subsequently escaped, for it is common in the high water ponds along the Whitman County shore of the Snake River. Many tadpoles and recently metamorphosed larvae as well as adults were taken during the autumn of 1930 and 1931 and the spring of 1931.

5. *Scaphiopus hammondii* Baird: western spadefoot toad.—Two specimens of the western spadefoot toad have been taken in Whitman County. Both of these were collected in the southwestern corner of the county in the dry basin sagebrush area.

6. *Bufo boreas boreas* (Baird and Girard): northwestern toad.—This is the common toad around Pullman and is found throughout the wheat land area as well as in the conifer growths. So far none have

been taken in the sagebrush area, although no doubt it occurs at least seasonally along the water courses in this area. Three specimens taken in Pullman are in the Museum's collections.

7. *Hyla regilla* Baird and Girard: Pacific tree-toad.—In the springtime, practically every roadside pool around Pullman resounds with the calls of these tree-toads. Egg masses are abundant in these pools by the middle of April. In early May a specimen was taken in an alfalfa field halfway up Kamiak Butte, evidently migrating to the woods after the breeding season, for the roadside pools were at this time practically dry. Specimens were collected from irrigation ditches at Wawawai, which is irrigated sagebrush country along the Snake River Canyon.

Reptiles

8. *Phrynosoma douglassii douglassii* (Bell): pigmy horn-toad.— The horn-toad occurs in the dry sagebrush areas along the Snake River Canyon and the western edge of the county. Accession records of a specimen from Almota and one from Rock Lake are in the Museum, although the specimens themselves have been lost.

9. *Eumeces skiltonianus* (Baird and Girard): western skink.—A specimen was taken from under a stone on the north bank of the Snake River near Wilma. Van Denburgh[3] mentions a specimen from Pullman.

10. *Charina bottae* (Blainville): Pacific rubber-snake.—The only records for the county are from Pullman and Kamiak Butte. Two of the three specimens from Kamiak have been lost. Another specimen was captured alive from Kamiak during the summer of 1931 and brought to Pullman but has since escaped.

11. *Diadophis amabilis occidentalis* Blanchard: western ring-neck snake.—One specimen of the ring-neck snake has been taken in the county, a new record for the state of Washington. The specimen was collected at Wawawai, which is on the Snake River.

12. *Coluber constrictor mormon* (Baird and Girard): western yellow-bellied racer.—The yellow-bellied racer occurs in the wheat land and conifer areas of the county where moist conditions prevail. Two specimens have been collected from Pullman, and one from Hole-in-the-Ground.

13. *Pituophis catenifer deserticola* Stejneger: desert gopher snake.—This snake is common throughout the county, occurring in each type of vegetation area. Specimens from Wawawai, St. John, Pullman, and Rock Creek are in the Museum collections.

14. *Thamnophis sirtalis concinnus* (Hallowell): northwestern garter snake.—Specimens of the northwestern garter snake have been taken from Pullman and Almota. It is distinguished from *T. o. vagrans* which is the only other garter snake occurring in this county, by its ground color, which is black instead of brown.

15. *Thamnophis ordinoides vagrans* (Baird and Girard): wandering garter snake.—This garter snake is perhaps more frequently found in the vicinity of Pullman than the preceding species. Four specimens from Pullman and one from Bald Butte are in the Museum's collections.

[3] Occ. Pap. Calif. Acad. Sci., 10, 1, 1922: 583.

16. *Crotalus confluentus oreganus* (Holbrook): Pacific rattlesanke.—The Pacific rattlesnake, which is more common further west in the sagebrush country about the Columbia River, has been found in the drier portions of Whitman County, such as the western and southern edges. A den of rattlesnakes has been reported in a rocky outcrop near Colfax. Two specimens have been collected from Almota and one from Hole-in-the-ground.

17. *Chrysemys bellii bellii* (Gray): western painted turtle.—The western painted turtle is frequently found in the springtime and early summer along creeks and roadside pools. Two specimens taken from a ditch along the road just outside of Pullman are in the Museum's collections.

STATE COLLEGE OF WASHINGTON, PULLMAN, WASHINGTON.

The Age of the Attainment of Sexual Maturity of the Leopard Frog *Rana pipiens* (Schreber) in Northern Michigan[1]

By EDITH R. FORCE

THE fact that the time required for the attainment of sexual maturity is definitely known for relatively few amphibians, prompted the present attempt at a solution of this question for the leopard frog *Rana pipiens*, as it occurs in northern Michigan.

The work was done during the summer of 1927, at the University of Michigan Biological Station, Cheboygan, Michigan, at the suggestion of Dr. F. N. Blanchard. The writer desires to express appreciation of Dr. Blanchard's assistance and of the courtesies extended by the University in the loan of the equipment used during this investigation.

Since the annual breeding season is short the frogs of a general collection should fall into size groups in accordance with their age. To demonstrate these groups and find out their respective sizes the effort was made to collect as many specimens of all sizes as possible at one time.

Measurement of the total length, i.e., from the tip of the snout to the posterior end of the urostyle, was taken on each individual collected. To make the measurements uniform, all the frogs were killed by drowning, immersed in 10% formalin for about two hours and then measured. Each specimen was dissected to determine the sex and the appearance and state of development of the gonads. No significant difference was observed in the measurements of the sexes when plotted separately, so in the discussions and graphs they have been treated together.

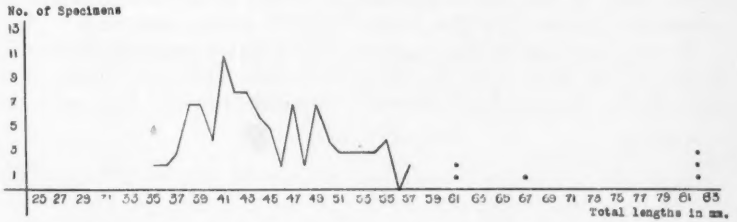
A short breeding season was indicated by the sudden appearance of small frogs in great numbers about July 23. As this was the first emergence this season it may be concluded that the smallest frogs obtained early in July were in their second season of growth, i.e., were those that transformed in the middle of the preceding summer.

[1] A contribution from the Biological Station of the University of Michigan.

On July 11 a representative series of 104 frogs was collected. Most of them were obtained from the grassy edge of a ditch-like stream bordering a filled-in cedar bog. The largest frogs may not have been found, but obviously the smaller ones represented the brood of the previous season. The sizes of the individuals in this collection are shown graphically in Figure I.

Another collection, of 124 individuals, was made July 30, 19 days later, at the same place. Their lengths were measured and plotted as in the earlier collection (Fig. II).

It may be noted from the figures (I and II) that the length ranges in the earlier collection are from 35 mm. to 57 mm. with the highest point at 41, and in the second collection the corresponding figures are 34 to 61 and 43. If, as appears, these modes represent the same group of indi-



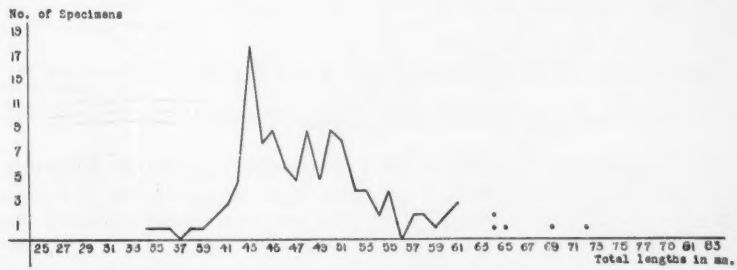


FIGURE I. Lengths and numbers of all males and females collected July 11, 1927
FIGURE II. Lengths and numbers of all males and females collected July 30, 1927

viduals, the difference between them must be due to the growth during the nineteen days. This difference, 2 mm., amounts to about 0.7 mm. per week.

If we consider, as is possible, that these frogs emerge from hibernation in this region in the later part of April, and remain more or less active until October first, their growing season would be approximately twenty weeks. Growth during this period at the rate determined above would amount to about 14.6 mm. in the season. This amount of growth is probably more than actually takes place, for it is based on what may occur during the most favorable part of the season. Earlier and later growth is presumably slower because of many cold days with less active feeding.

Further comparisons may be made with a collection of July 23, made at a different place, when the frogs were transforming in great numbers. As was to be expected, all sizes were collected but the majority of individuals (78 in number) ranged in length from about 25 mm. to about 34 mm., with the greatest number at 32 mm. (Fig. III). By a comparison of the peak in Figure III which represents the recently transformed individuals, with the peaks in Figures I and II we have evidence of growth of 10 to 11 mm. during the first year of the frog's life after metamorphosis.

Data given by Wright[2] on the rate of growth of this species based on the "measurement of frogs of all sizes collected at random over a period of ten years," shows a rate of growth of 0.5 inches or about 12.5 mm. for the first year. This compares very favorably with the figures obtained in this study, for the season favorable to growth in northern Michigan is undoubtedly shorter than that where Wright's studies were made.

In the dissections of these specimens there was a noticeable difference in the size and color of the gonads in the smaller and larger frogs. The testes of the fresh specimens showed a deepening of color from white in

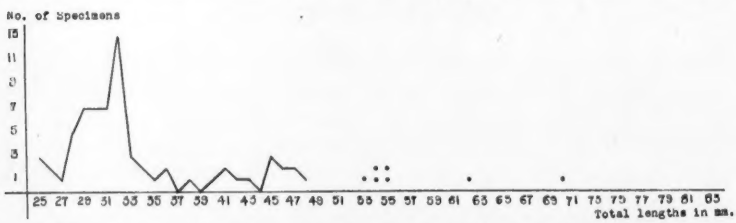


FIGURE III. Lengths and numbers of all males and females collected July 23, 1927

the youngest frogs, to yellow-white to deep yellow and orange, indicating an older group of individuals in the region of 45 mm. to 55 mm. in length. Similarly, the females measuring 54 mm. and over usually contained the egg cluster for deposition next year. Smaller females showed a variation in size of eggs in accordance with the length of the frog, but those from approximately 45 to 54 mm. seemed to show a development different from that of the smaller frogs.

The collections of July 11 and 30 contained a considerable number of frogs within the size limits 45 to 55 mm. On the graphs (Figs. I and II) they seem to form a group somewhat distinct from that of the year-old frogs, as well as from the fewer frogs of greater size. If, as must be the case, these frogs are in their third season, namely two years of age, they show an increase in length between the second and third season of about 7 mm., a somewhat slower growth than in the first year.

At this rate of growth the frogs of this group, 45 to 55 mm., would in one year more have attained the size and therefore the appearance of those frogs that appear to be breeders of this season. This would be their first breeding season, and they would be beginning their fourth season

[2] Wright, A. A. 1920. Frogs: their natural history and utilization. Bur. Fish. Doc. 888: 37.

of growth, that is they would be three years of age. These results are substantiated by similar measurements and dissections on approximately two hundred additional specimens of all sizes collected during the same summer on various dates.

SUMMARY

1. Evidence presented shows a growth in leopard frogs in northern Michigan of about 10 to 11 mm. in the first year after metamorphosis.

2. In the next year their increase in length is about 7 mm.

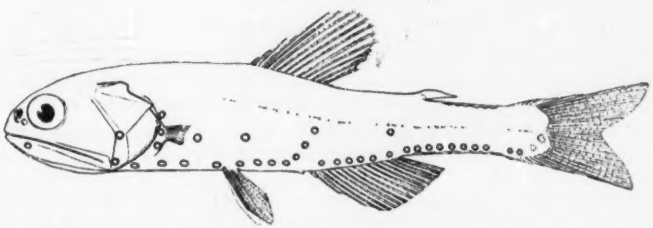
3. It appears that sexual maturity is attained at the age of three years (after hatching), or at the beginning of the fourth season of growth.

TULSA, OKLAHOMA.

Description of a New Myctophid Fish from off Bering Island

By PETER J. SCHMIDT

THIS small deepsea fish was dredged with a Sigsbee trawl at a depth of only 93 fathoms, September 7, 1929, off Cape Severny on Bering Island (Expedition of the Pacific Committee of the Academy of Sciences, U.S.S.R., 1929, P. J. Schmidt). No. 23745, Zoological Museum, Academy of Sciences, U.S.S.R.



Lampanyctus **beringensis,** new species

D. 14, A. 16, P. 8, V. 8, C. 7/18/8. L. lat. 38.

Head 3.3, depth 4.5 in body length without caudal; eye 4.6, snout 6.5, maxillary 1.3 in head. Body compressed, convex anteriorly, with a long caudal peduncle; the length of the latter from the adipose fin to base of caudal contained 4.5 times, its depth 10 times in the total length without caudal. Scales all lost. Head large, pointed. Snout not prominent. Jaws subequal. Maxillary extending far behind the eye. A small cutaneous ridge on the median line between the eyes. Origin of dorsal fin nearer snout than base of caudal; length of dorsal about equal to the length of maxillary; the two first rays are small, spinelike; the seventh is the longest, about as long as the maxillary. The anal fin of about the same length

as the dorsal. Ventral fins reaching the anus. Pectoral fins reduced, only about half as long as the diameter of the eyes.

Luminous organs small, round, without septa. One PLO (lost on left side), nearer to the pectoral fin than to the lateral line, and two subpectoral organs (PVO), near together, both on the base of the pectoral fin. Pectoral organs (PO) five, the fourth elevated, forming an equilateral triangle with the third and fifth. Ventral organs (VO) four, in one line with the pectoral organs; the distance between the first two about twice as long as the distances between the second, third and fourth. The supraventral organ, VLO, is placed about midway between the ventral series and the lateral line, above the enlarged interspace between the first and the second VO, forming an isosceles triangle with them. Distance between the first VO and VLO somewhat larger than that between the first and the second VO. Three supra-anal organs (SAO) in a straight, oblique series. The anal organs (AO) in two groups, 6 + 8, the posteroanal group beginning behind the anal fin. The posterolateral organ (POL) is above the interspace between the two groups of the anal organs; its distance from the lateral line about equalling its diameter. Three or four precaudal organs (PRC), two on the base of the caudal fin, in a line with the anal organs (AO); traces of the fourth are visible near the lateral line on the base of caudal fin; traces of the third are uncertain; probably they all form a curved line. Small luminous scales in an overlapping series on the caudal peduncle, 6 above and 8 below. Antorbital organ not enlarged. Two luminous organs behind the preopercle. Color blackish brown.

Total length to the base of caudal 52 mm., to the end of the middle caudal rays 59 mm.

The new species differs from *Lampanyctus nannochir* Gilbert[1] by the higher position of its POL and upper SAO, by having at least 2 PRC in a horizontal series at the base of caudal fin, with indications of a total *curved* series of four PRC, and by the more posterior location of its VLO (behind the first VO). It differs from *L. leucopsarus* Eigenmann and Eigenmann[2] by the presence and high position of its VLO, which is easily distinguished from the organ situated immediately above the first VO in *L. leucopsarus,* regardless of whether one may want to interpret the latter an elevated and advanced second VO or as a very low VLO. *L. beringensis* finally differs from both *L. nannochir* and *L. leucopsarus* in having its PLO nearer to the pectoral fin than to the lateral line. On the basis of these various characters, the new species seems well differentiated from its two nearest relatives.

ZOOLOGICAL MUSEUM, ACADEMY OF SCIENCES, LENINGRAD, U. S. S. R.

[1] See Parr: Notes on the species of myctophine fishes. *Proc. U. S. Nat. Mus.*, 76 (10) 1929: 18.

[2] Loc. cit.

Annotated List of Fishes of Georgian Bay

By G. C. Toner

SINCE 1928 the writer has been employed during the summer months as a field assistant with the Department of Game and Fisheries of Ontario. During this period most areas of the Georgian Bay were examined in connection with field studies of the commercial fisheries. The collecting of specimens was incidental to the other work, and as a result, there are many gaps in the area covered and fewer fish taken than one would wish. However, a number of species were submitted to Dr. Hubbs of the University of Michigan; others were submitted to Prof. Dymond of the University of Toronto; and in each case, positive identification of the species in question was given. The writer wishes to acknowledge his indebtedness to these men and also to Mr. Mackay of the Department of Game and Fisheries who has allowed several records to be published. The results given below were made possible by the Department of Game and Fisheries, the officials of which assisted in every way.

In making a list of the fishes of the Georgian Bay, or for that matter, of any area, the changing nomenclature of the last decade must be examined and a nomenclatorial system which seems to be the most satisfactory adopted. Several authors have written of the fishes of the area and covered a great deal of the ground work necessary in such a subject. Richardson (1836) is the most important, due to his early records of several genera. He collected, or received, quite a number of specimens from Penetanguishene in Simcoe county. Several other authors made lists of fishes of Ontario that include Georgian Bay, but until Bensley's work in 1914 there was no list that covered only the Bay. Bensley (1915) compiled an annotated list that has been standard for 15 years and still, though outdated in nomenclature, is the best review of the fishes of the Bay that is to be had. Hubbs and Brown (1929) give a number of records that are included in the notes of each species. Nash (1908) may be included in the list as for years his work was the standard for Ontario naturalists.

In the list given below there are many omissions as more intensive work will show. The writer has attempted to bring together the records of those who collected in previous years and to correlate these with his own collections.

1. *Petromyzon marinus* Linnaeus.—This lamprey is mentioned by Bensley (1915) as possibly in the Bay. I have no record of it myself.

2. *Ichthyomyzon concolor* (Kirtland).—Bensley (1915) records this species as taken on a garpike in Go Home River. I have taken lampreys probably of this species from the trout caught in the pound nets but unfortunately lost the specimens.

3. *Acipenser fulvescens* Rafinesque.—This fish at one time was quite common and even today is occasionally caught. One taken at the Mink Islands in 1930 weighed 176 pounds. The Nottawasaga River in the early

days was a great spawning area. Several are taken here each year.

4. *Polyodon spathula* (Walbaum).—The paddlefish is included on the authority of Nash (1908) who says that one was taken at the Spanish River and sent to the Bureau of Fisheries, Toronto. I was told by one of the older members of the Department that a number of the mounted fish were removed to the Normal School Museum some years ago. Recently (1933) the Normal School collection was removed to the Royal Ontario Museum. Among the fishes was a mounted cast and the paddle or snout of a *Polyodon*. While no data were attached it is reasonable to suppose that this paddle was taken from the original that was caught at the Spanish River in 1886.

5. *Lepisosteus osseus* (Linnaeus).—The long-nosed garpike is common everywhere in shallow water. Every author treating the fauna of the Bay mentions it. When trap nets were in use on the Bay these fish were taken in such numbers that it was necessary to take the nets ashore and clean them of the garpike before resetting.

6. *Amia calva* Linnaeus.—Most authors mention the dogfish as common in shallow water. A number of young were taken in 1928 and sent to the Museum of Zoology, University of Michigan.

7. *Dorosoma cepedianum* (Le Sueur).—Included here on the authority of Hubbs and Brown (1929), who say that Dr. Koelz took this species in Colpoy's Bay. I have no records of this fish.

8. *Oncorhynchus tchawytscha* Walbaum.—Hubbs (1926) includes this introduced species and mentions an adult male taken at Killarney, which is in the Provincial Museum, Toronto.

9. *Salmo fario* Linnaeus.—Brown trout were introduced in the Sydenham River at Owen Sound by the Department of Game and Fisheries and thrived to some extent. A fish weighing over eight pounds is mounted in the pavilion at Harrison Park near Owen Sound. This is the third species to be introduced into this river. It was stocked, also, with rainbows and brook trout and the three species seem to thrive in the same waters. The river is heavily fished and this may be the reason for the compatibility of species usually thought to be antagonistic to each other.

10. *Salmo gairdnerii* Richardson.—I follow Hubbs and Brown (1929) in the naming of this fish, with the rainbow distinguished as *S. g. irideus* Gibbons. Rainbows are occasionally taken in the commercial nets set in shallow water. They do not seem to range into very deep water and return to the streams to spawn. Good fishing at certain seasons may be had in the Sydenham River.

11. *Cristivomer namaycush* (Walbaum).—The lake trout is the standby of the commercial fisheries of the Great Lakes. During 1930 over a million and a quarter pounds were caught in Georgian Bay (Game and Fisheries Department, 1930). Several races are distinguished by the fishermen. These are apparently more of the nature of ecological varieties than subspecies proper. Gillies Lake on the Bruce Peninsula has a small variety that may eventually be classed as a subspecies. The specimens

taken from here were lost and until more are taken and examined by an authority, they should be regarded as *C. n. namaycush.*

12. *Salvelinus fontinalis* (Mitchill).—Brook trout are probably native to this region, especially in the lower reaches of the rivers. The early records would seem to show that this fish was introduced into many of the streams entering the Bay. Richardson (1836) found it at Penetang but it is not native along the north shore, as many of the streams have none at present. It may be that they were destroyed in such streams but it seems more likely that there are gaps in the distribution. Since they are held in such high esteem every brook that can be planted contains these fish. An item from the "Thursday Morning" of Owen Sound for Sept. 10, 1931, may be of interest in this connection.

> More than a century ago a man named Herriman (father of the late A. A. Herriman, who died about 25 years ago at the ripe age of 90 years), came to Canada with the Hudson Bay company and trapped fur for them all through the Georgian Bay wilderness. He it was who carried, 120 years ago, the first speckled trout to the Sydenham in a pail from below Inglis' Falls and deposited them above. These few thrived till the river literally swarmed with speckled beauties.

13. *Leucichthys artedi* (Le Sueur).—Several specimens of the shore herring were submitted to Dr. Hubbs who identified them as *L. a. artedi.* Those of the North Channel are the form known as *L. a. manitoulinus.* In the vicinity of Killarney and west the two forms intergrade. Richardson (1836) recorded this species from Penetang as *Salmo (Coregonus) harengus.* Jordan and Evermann (1911) listed specimens from various places in the Bay and Lake Huron as *L. harengus, L. manitoulinus* and *L. cisco huronius.* Koelz (1929) says that they are found out of every port on the Bay. I have found them very common all over the Bay. Great quantities are taken as bait for trout and along the North Shore as food.

14. *Leucichthys alpenae* Koelz.—Included on the records of Koelz (1929). This is probably one of the fish known as "tulibee" by the fisherman. Usually taken in deep water.

15. *Leucichthys johannae* (Wagner).—I have not found this fish in the Bay but have taken specimens off Cape Hurd in Lake Huron. Koelz (1929) says that it is generally distributed throughout the Bay.

16. *Leucichthys nigripinnis* (Gill).—This species was taken off Cape Hurd in Lake Huron with *L. johannae* and *L. zenithicus.* Quite plentiful in most parts of the Bay.

17. *Leucichthys hoyi* (Gill).—The "bloater," as it is known to the fishermen, is abundant everywhere in the Bay. It is usually taken in water over 10 fathoms in depth. These small fish are a nuisance to the gill-net fishermen as they enter the nets in great numbers and become entangled. Even 6-inch mesh trout nets will take many. A number of specimens were collected off Flower Pot Island and submitted to Dr. Hubbs for identification.

18. *Leucichthys kiyi* Koelz.—Koelz (1929) records this species from many ports of the Bay. I have no records of its occurrence.

19. *Leucichthys zenithicus* (Jordan and Evermann).—One specimen was taken off Cape Hurd in Lake Huron. The three species taken off this point were from a commercial catch of "bluefins" as they are known to some of the fishermen. The nets used here were set in from 70 to 100 fathoms of water. *L. zenithicus* is a deep water fish and may be one of the species known locally as "tulibee." More information as to the common names and distribution is needed for the "tulibees" in Georgian Bay. From observation these are a complex of several species known by the same common name. The deep water nets will take all the larger species of *Leucichthys* and these may be sold as "tulibee," "chub" or "bluefin."

20. *Coregonus clupeaformis* (Mitchill).—Whitefish are taken everywhere in the Bay by the commercial fishermen. It is apparently a fish of the moderate depths and is usually found over shoals and banks where the water is between 10 and 30 fathoms in depth. It runs inshore to spawn when it is taken in great numbers by the pound nets. Bensley (1915) tentatively divides the Georgian Bay whitefish into two races. He gives some figures and measurements of both his possible varieties. Koelz (1929) says that the Great Lakes whitefish is remarkably constant in its characters. I have no evidence of any morphological differences in the specimens taken.

21. *Prosopium quadrilaterale* (Richardson).—This species is known by a number of common names on the Georgian Bay. "Cisco" is the commonest name but I have heard it referred to as the "menominee" and as the "cross whitefish." It is not taken anywhere in abundance, though it is common all over the Bay. Several specimens were sent to Prof. Dymond of Toronto who placed them in the University of Toronto collection.

22. *Osmerus mordax* (Mitchill).—The smelt was introduced into the Great Lakes about 1912, according to Creaser (1929) and has increased to a great extent. Through the courtesy of the Ontario Department of Game and Fisheries, I am allowed to include a record from Tobermory. Several specimens sent to the Department were identified by Dr. Hubbs. It will be interesting to watch the progress of this fish in Canadian waters.

23. *Anguilla bostoniensis* Le Sueur.—I have never heard of the eel on the Bay but Bensley (1915) says that they have been taken at the Severn River.

24. *Catostomus commersonnii* (Lacépède).—The common sucker may be taken anywhere in the Bay in shallow water. The young are very plentiful in the rivers and streams and probably form a good percentage of the food of the game fishes. A number of stomachs and their contents were collected around the Musquash River. These are in the Department of Game and Fisheries collection at Toronto.

25. *Catostomus catostomus* (Forster).—This species is especially abundant in the vicinity of Owen Sound where as many as three thousand pounds have been taken in one lift of the pound nets. Neither this nor the preceding species are utilized to any extent. Fur farms take a few at some seasons of the year.

26. *Moxostoma anisurum* (Rafinesque).—Bensley (1915) reports that this fish is taken in the gill nets in the southern part of the Bay. I have one specimen from Wasaga Beach that is in the Royal Ontario Museum of Zoology.

27. *Cyprinus carpio* Linnaeus.—Carp were introduced into Lake Simcoe, accidentally, a number of years ago, and as elsewhere, have increased to an enormous extent. A very profitable fishery has been established in Matchedash Bay. Though common everywhere they are not abundant on the west and north shores.

28. *Chrosomus eos* Cope.—Hubbs and Brown (1929) recorded this species from Pointe au Baril under the name of *C. erythrogaster*. I did not find it.

29. *Couesius plumbeus* (Agassiz).—I have one record from Tobermory where it is common around the docks .

30. *Notemigonus crysoleucas* (Mitchill).—Bensley (1915) says that this species is very abundant and most authors have mentioned it as being common. I took four specimens in the Wye River which were identified by Dr. Hubbs.

31. *Pfrille neogaea* Cope.—This cyprinid was recorded by Hubbs and Brown (1929) from Pointe au Baril. I did not collect it.

32. *Semotilus atromaculatus* (Mitchill).—I took this species in the Sydenham River. A number submitted to Dr. Hubbs were identified as *S. a. atromaculatus*.

33. *Rhinichthys atronasus* (Mitchill).—Bensley (1915) said this fish inhabits and appears to be confined (in the Bay) to rock pools on exposed reefs. I took three specimens from the fast water of the Sydenham River. These were identified by Dr. Hubbs as *R. a. meleagris*.

34. *Pimephales promelas* Rafinesque.—Hubbs and Brown (1929) record this species from Pointe au Baril.

35. *Notropis atherinoides* Rafinesque.—Bensley (1915) says that large schools occur near shore. I found it abundant near McRea's Dam and also in the Wye River. Several were submitted to Dr. Hubbs for identification.

36. *Notropis cornutus* (Mitchill).—This is probably the most abundant minnow in the Bay. Immense schools were seen in the fast waters of the rivers during June. A number submitted to Dr. Hubbs were identified as *N. c. frontalis*. Specimens were taken at Tobermory, Sydenham River, Wye River and McRea's Dam.

37. *Notropis hudsonius* (DeWitt Clinton).—This species was recorded as *N. h. selene* by Hubbs and Brown (1929). Their fish came from near Pointe au Baril. I have three specimens taken in the Wye River.

38. *Notropis volucellus* (Cope).—Most authors mention this fish as common in the Bay. Seven specimens submitted to Dr. Hubbs were identified as *N. v. volucellus*. These were taken in the Wye River.

39. *Notropis heterolepis* Eigenmann and Eigenmann.—Recorded from Pointe au Baril by Hubbs and Brown (1929). I did not find it.

40. *Hyborhynchus notatus* (Rafinesque).—Bensley (1915) collected this minnow from all points between Waubaushene and Byng Inlet. Hubbs and Brown (1929) report it from several points on the east shore. Apparently it is very common but I have no records.

41. *Ictalurus punctatus* (Rafinesque).—This species, the channel cat, is included on the basis of one specimen seen, though not collected, from a pound net at the mouth of the French River. The fishermen report this species as occasional in the nets.

42. *Villarius lacustris* (Walbaum).—Bensley (1915) includes this species and says that it occurs in small numbers along the main shore. I have no records of it.

43. *Ameiurus natalis* (Le Sueur).—Richardson (1836) described what is apparently this species from Penetang, under the name *Silurus (Pimelodus) coenosus*. Catfish are quite common in certain areas and large numbers are taken in the hoop nets at Collingwood and Sturgeon Bay. Presumably this species will be found in the catch of these nets.

44. *Ameiurus nebulosus* (Le Sueur).—Hubbs and Brown (1929) record this species from Pointe au Baril. I have no definite records of it but it is known to be quite plentiful in shallow water. Except in the hoop nets they are not taken by the commercial fishermen. Large catches are made in the rivers using worms for bait. They are of considerable economic importance as a panfish that is easily caught.

45. *Esox masquinongy* (Mitchill).—The muskallunge is the lure that draws the anglers to the east shore of the Georgian Bay. It was formerly quite abundant but of late years has dwindled in numbers. In four years work on the Bay I have only seen 10 fish of this species. The average weight of these was around 20 to 25 pounds. It is taken occasionally in the pound nets but must be liberated when so caught. A few are taken each year in Midland Harbour. Richardson (1836) says that it is rather scarce being more common in Lake Erie and southern Canadian waters.

46. *Esox lucius* Linnaeus.—Very common everywhere and usually not regarded very highly by the angler, the pike is still a commercial fish and the pound nets take them in great quantities.

47. *Umbra limi* Kirtland.—Bensley (1915) took this species in the muddiest parts of the shore swamps. Hubbs and Brown (1929) say that it is found at Pointe au Baril. Usually found in the smaller ditches and creeks of Simcoe county.

48. *Lota maculosa* (Le Sueur).—The ling is regarded as a pest by the fishermen and from time to time the Government is asked to reduce the numbers in the Bay. Some research is being done at present looking toward its utilization. It is found in water from 10 to 70 fathoms in depth. In one lift of a gill-net gang from 40 fathoms 400 were taken.

49. *Fundulus diaphanus menona* Jordan and Copeland.—Bensley (1915) says that this fish was frequently taken.

50. *Percopsis omiscomaycus* (Walbaum).—Bensley (1915) took one

specimen at Go Home Bay. I did not find it in any of the hauls made though it is probably abundant in restricted areas.

51. *Labidesthes sicculus* Cope.—Bensley (1915) records the silverside as taken in most seinings from the shore swamps.

52. *Eucalia inconstans* (Kirtland).—Bensley (1915) says that this species is rare everywhere along the shore. Hubbs and Brown (1929) record it from Pointe au Baril. I took them in quantities at McRea's Dam. In an examination of stomach contents, fish eggs were found and as they were taken when pike-perch *(Stizostedion vitreum)* were spawning, it was presumed that they were feeding on the spawn of this fish. The eggs eaten were small and much like those of the pike-perch.

53. *Perca flavescens* (Mitchill).—Found everywhere in the Bay, the perch does not seem to grow to such a large size as farther south.

54. *Stizostedion vitreum* (Mitchill).—The common name of this fish should be pike-perch but it is known to the fishermen as "pickerel." Great quantities are taken by the pound nets. It is well known to the anglers and is usually regarded quite highly as a sporting and food fish. Of late years, with better control of illegal fishing, this species seems to be increasing.

55. *Poecilichthys exilis* (Girard).—Several specimens were sent to the Museum of Zoology at the University of Michigan from the vicinity of Honey Harbour. These were taken on the sand beaches in June.

56. *Boleosoma nigrum* (Rafinesque).—Two specimens sent to Dr. Hubbs were identified as *B. n. nigrum.* Taken with the preceding species on sand beaches near Honey Harbour.

57. *Percina caprodes* (Rafinesque).—Bensley (1915) says that it is taken on sand beaches where there are aquatic plants.

58. *Aplites salmoides* (Lacépède).—Richardson (1836) records this species from Penetang as *Perca (Huro) nigricans.*

59. *Micropterus dolomieu* Lacépède.—Common everywhere but showing the drain of constant angling. Georgian Bay is noted for its black bass and hundreds of anglers come here every summer.

60. *Xenotis megalotis* (Rafinesque).—Included here on the record of Hubbs and Brown (1929) from Honey Harbour.

61. *Eupomotis gibbosus* (Linnaeus).—This is the common sunfish of these waters. It can be taken almost everywhere on the east shore.

62. *Ambloplites rupestris* (Rafinesque).—The rock bass is the best known and most common fish of the shallow water. It is extremely abundant everywhere on the east shore.

63. *Aplodinotus grunniens* (Rafinesque).—Included here on the authority of Richardson (1836), who described a specimen from Penetang under the name of *Sciaena (Corvina) richardsonii.*

64. *Cottus bairdii kumlieni* Hoy.—Recorded from Giant's Tomb Island by Bensley (1915) under the name of *C. ictalops.*

65. *Cottus ricei* (Nelson).—One specimen taken from the stomach of

a "bluefin" was identified by Dr. Hubbs. It is a fish of the very deep water.

66. *Cottus cognatus* (Richardson).—Recorded by Bensley (1915) as *Uranidea franklini*. Taken by myself in the deepwater bait nets of Griffiths Island and identified by Dr. Hubbs.

67. *Triglopsis thompsonii* Girard.—This sculpin is taken quite frequently in the deep water nets. One specimen was sent to the Museum of Zoology at the University of Michigan.

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A New Australian Fish

By N. A. Borodin

AT a recent meeting of the American Society of Ichthyologists and Herpetologists I had an opportunity to show the specimen which I am about to describe, to Drs. Carl L. Hubbs and George J. Myers and Mr. J. T. Nichols, and it is a pleasure to record their agreement in my decision to erect a genus for this curious little fish. I therefore proceed to describe:

Congrogadoides spinifer, new genus and species

Holotype: M.C.Z. 33106, 92 mm. long, collected June 1932 at Broome, Northwest Australia, by Professor Hubert L. Clark.

This new form has the general appearance and most of the characters of *Congrogadus* Richardson. The generic differences consist in the possession of a single separated spine in front of the dorsal fin and a lateral line having but 23 instead of 50 tiny papillar projections. *Congrogadoides* agrees with the other genera referred to the Congrogadidae by Regan (Ann. and Mag. Nat. Hist., (8) 10, 1912: 268) in having a dorsal spine, but differs from them in having the gill membranes united, the branchiostegals 6 instead of 4, etc.

Br. 6; D. I–71; A. 60; P. 10; C. 10; L. l. 23, incomplete; transverse scales over lateral line 12.

Body elongate, eel-shaped, strongly compressed. The depth of the body is contained 9.2 in the total length. Head 7.75 in length; its general form is triangular with a protruding hypohyal bone and slightly trenchant upper portion. Mouth moderate; maxilla reaching the middle of the eye. Opercular portion of head slightly swollen. Lower jaw a little longer than the upper; both supplied with strong slightly curved teeth, 40 in number on each jaw. Eye 3 in head; snout equal to diameter of eye. Gill opening narrow. Gill membranes, with well developed brachiostegals, united at the isthmus.

Vertical fins confluent with the caudal fin. The dorsal fin consists of a single separate short spine (2 mm. long), situated directly above the posterior tip of the pectoral fin, and about 2 mm. from the first ray, and of 71 rays 4–8 mm. long. The anal fin has 60 rays. The pectoral fin is short, 2.4 in head, and has 10 rays.

The body is covered with minute scales, embedded in the skin. Lateral line present only on the anterior portion of the body and composed of 23 papillae. It ends beneath the fourth ray of the dorsal fin. The cheeks are scaly; the top of the head is naked and covered with several pores which run from the posterior portion of the neck to above and around the eyes.

The general coloration of the body is brown. The head is of a brighter color. On the alcoholic type there are the following markings: a well marked oval black ocellus, as large as the eye, surrounded by a whitish ring; a marking like a broad blackish bridle on the anterior portion of the head; a regular row of large, more or less round, transparent spots along

the base of the dorsal fin. These are 33 in number and are easily seen especially when looked on in liquid. The tips of dorsal and anal fins are blackish. The whole skin and the fins are black spotted.

The new species resembles in general appearance *Macherium subducens* described by Richardson (Erebus and Terror, Ichthyology, 1848: 72, pl. 44). Günther, however, changed the generic name since it was preoccupied, in ornithology, to *Congrogadus* and included *C. subducens* (Rich.) in his Catalogue of the Fishes of the British Museum, 4, 1862: 388–389, as a separate group of the family *Ophidiidae*. The generic characters of *Congrogadus* as originally given by Richardson indicated the absence of ventral fins and of spines ("Spinis Nullis") and the termination of the lateral line beneath the tenth dorsal ray.

Our new genus and species differs from *Congrogadus subducens* (Richardson) in having a short separate spine in front of the dorsal fin, a lateral line consisting of 23 (not 50) elements, terminating under the fourth and not the tenth dorsal ray. Other differences are: a shorter head (7¾ and not 5¾ in length) and a much larger eye (four and not six times in head). The new species has no basal scales with filaments on the rays of the dorsal and anal fins as in Richardson's fig. 1, pl. 44. There is also a considerable difference in coloration: *C. subducens* has no bright spots below the dorsal fin and the black ocellus with the white ring is not figured by Richardson or in the later illustration by McCulloch (Rec. Australian Mus., 17, No. 3, 1929).

In order to eliminate any doubt that our new fish might be the young of *C. subducens*, I have examined two specimens of *C. subducens*, 155 and 151 mm. long, very kindly loaned to me by the kindness of Dr. J. R. Norman of the British Museum. I find that they have no spine in front of the dorsal fin and that all the characters agree exactly with those of larger specimens (one of 405 mm. from the British Museum, and one of 340 mm. in the Museum of Comparative Zoology (No. 33122). The comparison makes it clear that the new fish is not the young of *C. subducens* (Richardson). Moreover, Mr. G. P. Whitley of the Sydney Museum has published a description, accompanied by a drawing, of a larva of *C. subducens* 23 mm. long, which shows no spine in front of the dorsal fin (Australian Zoologist, 4 (4), 1926: 236).

MUSEUM OF COMPARATIVE ZOOLOGY, HARVARD UNIVERSITY, CAMBRIDGE, MASSACHUSETTS.

Cottus protrusus, a New Sculpin from Unalaska Island

By LEONARD P. SCHULTZ and WILLIAM A. SPOOR

Cottus ***protrusus,*** new species

THE holotype, 40 mm. long to caudal, was collected with five paratypes,[1] 56, 49, 48, 44 and 41 mm. long, in a small lake on Unalaska Island, about 400 feet above Makushin Bay, and half a mile inland, by the junior

[1] Two of these paratypes, one 44 mm. and the other 49 mm. long were given to the United States National Museum and the Museum of Zoology, University of Michigan, respectively.

author on May 30, 1930; Cat. No. 2334, Department of Fisheries, University of Washington.

The body is long, slender, gradually tapering from the blunt head to the long, slender caudal peduncle. The head appears less blunt in two paratypes in which the eyes do not sharply protrude. The body is constricted on the ventral side at the origin of anal fin. Body and head are without detectable prickles. The caudal peduncle is of the slender constricted type; its least depth is contained about 1.0 times in the snout, 4.51 to 5.45 times in the head, and 15.48 to 20.0 times in the standard length.

The preopercle bears but a single spine at its angle, below which the edge is entire except for a small, rounded elevation indicating the position of the usual second spine. Teeth are developed on the vomer, but not on the palatines. The caudal vertebrae are numerous, falling into the 24 to 29 class (Schultz, 1930: 14–15), thus agreeing with *C. asper* and *C. aleuticus*, instead of the 20 to 23 class as found in *C. rhotheus, C. gulosus* and *C. beldingi* (see Hubbs and Schultz, 1932: 6, table I).

The head is flattish above and blunt anteriorly, with large protruding eyes (hence the name *protrusus*), as in *Cottus chamberlaini* Evermann and Goldsborough (1907: 309, fig. 66); the eyes project beyond the dorsal profile on the holotype and one paratype as much as two times the diameter of the pupil. The eyes are less protruding in the other specimens. The interorbital is very narrow; in fact the eyes, meeting each other in the midline, obscure the interorbital space. Both pairs of nostrils are distinctly tubular, elevated as much as one and a half times the diameter of the pupil. The lateral line is either complete or incomplete, as a few pores are sometimes lacking on the caudal peduncle.

The mouth is moderate, low, nearly horizontal; the maxillary scarcely reaches the front of the pupil; the margin of the upper lip is somewhat pointed as seen from above.

A distinct space separates the spinous and soft dorsal, as was described for *C. chamberlaini* but not shown in the figure of the type of that species. The origin of the spinous dorsal is slightly behind the base of the pectoral fin; the origin of the soft dorsal is over the anal opening, a little anterior to the insertion of the anal fin.

The following counts and measurements were made on the six specimens. The figures not in parentheses were taken from the holotype, those in parentheses were taken from the paratypes, the last figure representing counts and measurements made on the specimen given to the United States National Museum. Dorsal X, 19 (IX, 19, IX, 18, IX, 19, X, 19 and IX, 19); anal rays 13 (13, 13, 13, 14 and 13); left pectoral rays 16 (13, 15, 15, 15 and 15); right pectoral rays 16 (15, 16, 16, 14 and 14); pelvic rays I, 4 (I, 4, I, 4, I, 4, I, 4 and I, 4); left branchiostegal rays 7 (7, 7, 6, 6 and 6); right branchiostegal rays 7 (6, 6, 6, 6 and 6); caudal vertebrae — (25, 26, 26, 26 and —); greatest depth in length 5.33 (5.09, 5.44, 5.33, 5.12 and 5.50); greatest width of body in length 6.66 (5.3, 6.0, 6.0, 5.86 and —); least depth of caudal peduncle in length of snout 1.0 (1.0, 1.0, 1.0, 1.0 and —); least depth of caudal peduncle in body length 20.0 (16.0, 16.33, 15.48, 18.63 and —); least depth of caudal peduncle in head 4.8 (4.85,

5.0, 4.51, 5.45 and —); length of caudal peduncle in head 1.71 (1.70, 1.66, 2.00, 2.00 and —); head in length 3.33 (3.29, 3.27, 3.43, 3.41 and 3.5); depth of head in breadth of head 1.0 (1.05, 1.14, 1.0, 1.0 and —); length of snout in head 4.8 (4.85, 5.0, 4.51, 5.45 and 4.3); upper jaw in head 3.0 (2.83, 3.0, 2.80, 3.0 and 3.0); diameter of orbit in head 3.0 (3.0, 3.46, 3.5, 3.0 and 2.9); tip of snout to anus in standard length 1.90 (1.80, 1.92, 2.00, 1.86 and —); tip of snout to origin of anal fin in standard length 1.82 (1.70, 1.80, 1.85, 1.71 and —); base of anal fin in standard length 3.63 (3.73, 3.77, 3.44, 3.90 and —); length of longest ray of spinous dorsal in head 2.40 (2.43, 2.50, 2.54, 2.40 and 2.0); length of longest

TABLE I—COUNTS AND MEASUREMENTS OF SPECIMENS OF COTTUS FROM ALASKA

		Cottus chamberlaini		*Cottus protrusus*
		Loring	Aleknagik Lake	Unalaska Is.
Head in length	3.0 to 3.1	5	–	–
	3.2 to 3.3	4	1	3
	3.4 to 3.5	1	–	3
Depth in length	4.2 to 4.4	1	–	–
	4.5 to 4.6	4	1	–
	4.7 to 4.8	2	–	–
	4.9 to 5.0	2	–	1
	5.1 to 5.2	1	–	2
	5.3 to 5.4	–	–	3
Eye in head	2.9 to 3.2	4	–	4
	3.3 to 3.6	5	1	2
	3.7 to 3.8	1	–	–
Dorsal fin spines	VIII	8	–	–
	IX	2	1	4
	X	–	–	2
Soft rays	16	9	1	–
	17	1	–	–
	18	–	–	1
	19	–	–	5
Anal fin rays	11	6	1	–
	12	4	–	–
	13	–	–	5
	14	–	–	1

ray of soft dorsal in head 1.7 (1.88, 1.76, 1.75, 2.00 and 1.8); length of longest ray of anal in head 2.00 (1.70, 1.80, 1.55, 2.00 and 2.0); length of longest ray of caudal fin in head 1.20 (1.41, 1.50, 1.27, 1.33 and —); length of longest ray of pelvic fin in head 1.33 (1.54, 1.50, 1.40 and 1.3); length of longest ray of pectoral fin in head 1.00 (1.15, 1.00, 1.00, 1.00 and 1.00); width of interorbital space in eye — (—, 6, 6, — and —)[2].

The color in alcohol is dark brownish, somewhat mottled above; the sides with 4 or 5 irregular vertical dark blotches, one under the spinous dorsal, 2 or 3 under the soft dorsal, and one on the caudal peduncle. The under parts are yellowish white, without fine stipplings except on the 56 mm. paratype which is profusely marked with minute punctulations. All fins are dark colored and mottled like the body.

[2] The protruding eyes obscure the interorbital space so much in 4 specimens that it was not possible to make an accurate measurement of this character.

Cottus protrusus is distinguished from all other American species of *Cottus* except *C. chamberlaini* by the blunt head with large protruding eyes, contained 2.9 to 3.5 times in head, and the very narrow interorbital space, contained about 6 times in the eye. In Europe and Asia we do not find a single species of *Cottus* which approaches *C. protrusus* and *C. chamberlaini* in shape of head, size of eye, and the narrow interorbital space (Berg 1932: 17–20; Berg 1916: 434–442; Jordan and Starks 1904: 264–269).

In having two pairs of tubular nostrils *Cottus protrusus* agrees with the following American species: *C. aleuticus* Gilbert (1895: 418); *C. chamberlaini* Evermann and Goldsborough (1907: 308), and *C. tubulatus* Hubbs and Schultz (1932: 3–4). *C. tubulatus* has nostrils much less tubular than in *protrusus* and *chamberlaini,* has only 20 to 23 caudal vertebrae and differs from *protrusus* in other characters. *C. aleuticus* (one paratype, and numerous specimens from Washington to California, examined) has a broader interorbital space, and has non-protruding and smaller eyes, contained 4 1/3 to 4 3/5 times in the head. The posterior pair of nostrils is semitubular in *C. rhotheus* and *C. punctulatus,* but those species both have 20 to 23 caudal vertebrae instead of 25 or 26.

The chief differences between *C. protrusus* and *C. chamberlaini* are to be found in the number of rays in the dorsal and anal fins (see Table I).

Cottus chamberlaini was first collected near Loring, Alaska (Evermann and Goldsborough, 1907). Recently Mr. Claude E. Flock, a former student of the senior author, took a single specimen of *C. chamberlaini* from Aleknagik Lake, on July 28, 1932. As nearly as we can determine, this extends the range about 1100 miles to the northward. *C. protrusus* has been taken only on Unalaska Island, which is about 500 miles west of Lake Aleknagik, Alaska.

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New Names For Fossil Fishes[1]

By Gilbert P. Whitley

IT is unfortunate that preoccupied generic names have been applied to many fossil fishes. Some of these, which have come to my notice whilst compiling a proposed *Genera Piscium,* evidently require substitute names; the changes suggested hereunder are as slight as practicable.

Traquairichthys, new genus (Elasmobranchii, Acanthodidae)

Orthotype, *Acanthodes pygmaeus* Fritsch=*Traquairichthys pygmaeus.*

Replaces *Traquairia* Fritsch, 1893, preoccupied by *Traquairia* Carruthers, 1872, a genus of Protozoa.

Ohiodorulites, new genus (Psammosteidae)

Orthotype, *Acanthaspis armatus* Newberry = *Ohiodorulites armatus.*

For *Acanthaspis* Newberry, 1875, preoccupied by *Acanthaspis* Amyot and Serville, 1843, in Hemiptera.

Absalomichthys, new genus (Caristiidae)

Orthotype, *Abantis velifer* Jordan = *Absalomichthys velifer.*

This new name replaces *Abantis* Jordan, 1925, which is preoccupied by *Abantis* Hopffer, 1855, a genus of Lepidoptera and by *Abantis* Fairmaire, 1892, another insect genus.

Heintzichthys, new genus (Dinichthyidae)

Orthotype, *Dinichthys corrugatus* Newberry.

Replaces *Stenognathus* Newberry, 1889, which is preoccupied in Coleoptera by *Stenognathus* Chaudhoir, 1843, and in Ophidia by *Stenognathus* Duméril, 1853.

Named after Mr. Anatol Heintz, who has recently reconstructed the large-eyed *Heintzichthys gouldi* (Newberry), of which *corrugatus* is regarded as a synonym.

Homonotichthys, new genus (***Homonotichthyidae,*** new family)

Orthotype, *Homonotus dorsalis* Agassiz = *Homonotichthys dorsalis.*

This genus is allied to the holocenthrid and berycoid fishes but has smoother opercular bones, preoperculum serrated but without any large spine, and operculum produced into one long spine posteriorly. V. I, 6; twelve or more dorsal and four anal spines.

Homonotus Agassiz, 1850, is preoccupied in Hymenoptera by *Homonotus* Dahlbom, 1845, so is here renamed.

The Australian Museum, Sydney, New South Wales.

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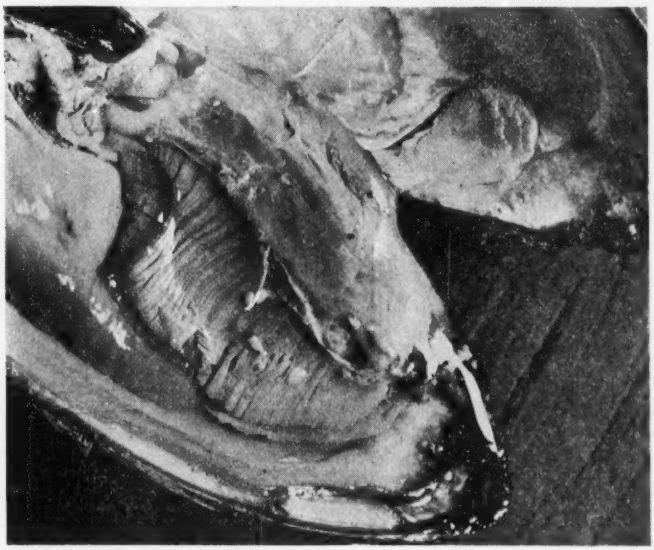
Rhodeus amarus Spawning in American Mussels

By C. M. Breder, Jr.

THE European bitterling, *Rhodeus amarus* (Bloch), was introduced into the Sawmill River, Westchester County, New York, in 1925 or earlier, and its occurrence there has been recorded by Myers (1925), Dence (1925) and Bade (1926). It disappeared shortly thereafter and questions were raised at the time of the likelihood of American mussels being sufficiently suitable for the peculiar reproductive needs of this minnow.



—Photo by S. C. Dunton

Embryos of *Rhodeus amarus* in the American mussel, *Anodonta cataracta* Say. Three have been removed from their pockets in the gill folds and a fourth can be seen in place. Subsequent dissection revealed a total of ten.

Since then, the good friend of the New York and the Rotterdam Aquariums, Mr. J. F. Emde of the SS. *Statendam,* kindly transferred a collection of the bitterling to the former institution. In the spring of 1933 (late May and early June), these showed considerable sexual activity in an exhibition aquarium of mixed fishes, newts and mussels. As it appeared that the latter were not unacceptable to *Rhodeus,* some of both were established in an observation aquarium where they might be better studied. In the due course of time postlarval bitterling appeared, presumably incubated within the shells of either *Unio complanatus* (Dillwyn) or

[1] Dr. W. G. Van Name of the American Museum of Natural History kindly named these mussels.

Anodonta cataracta Say, or both.[1] These, the offspring of not more than five females, numbered about one hundred.[2]

Following on this, a laboratory aquarium was provided with three female and two male bitterling, as well as four mussels, *Unio complanatus*. Only one of the females was apparently spawning, as evidenced by the extent of its ovipositor which reached to the base of the caudal fin. Three days later the ovipositor was retracted to about one-third that length and the males lost their nuptial coloration as well as interest in the females and the mussels. Although actual oviposition was not observed, the courtship behavior checked closely with the frequent descriptions appearing in Continental aquarium journals. Four days subsequent to this, one of the mussels was opened and in the gill folds were found seven *Rhodeus* embryos which when removed were able to gyrate about in a dish of water. These were embedded in a manner identical with the figures and descriptions of those in European mussels. Two specimens of the other mussel, *Anodonta cataracta,* from the exhibition aquarium contained three and ten embryos respectively.

Since *Rhodeus* in Europe is definitely known to regularly use both *Unio pictorum* (Linnaeus) and *Anodonta cygnea* (Linnaeus) at least, it would seem that a large variety of mussels can serve satisfactorily for the reproductive needs. Wording it another way, it seems unlikely that the particular distribution of any of the numerous species of larger fresh-water bivalves restricts the distribution of this cyprinid. Certainly the failure of the Sawmill River planting cannot be ascribed to unsuitable breeding sites, as a variety of mussels abound in that stream. A too energetic collecting has been suggested, which may well have something to do with the disappearance. Heavy pollution by factory wastes, as observed by employees of the New York Aquarium, seems to be a more complete explanation, however, for in 1927 such was in considerable evidence together with dead specimens of a variety of native species.

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MYERS, G. S.
1925 Introduction of the European bitterling *(Rhodeus)* in New York and of the rudd *(Scardinius)* in New Jersey. COPEIA, 140: 20–21.

NEW YORK AQUARIUM, NEW YORK CITY.

[2] The only record known to the writer of an attempt to induce *Rhodeus* to spawn in an American mussel is that of Borden (1918), in which case eggs were deposited, but the unnamed mussels died.

Herpetological Notes

DEATH FROM INSOLATION IN DESERT SNAKES.—While carrying on an ecological investigation on the fauna of a sand dune area in Coachella Valley, California, the writers took occasion to determine the actual foundation of the popular belief that the sidewinder dies when exposed to the desert sun.

Three specimens were used in the following simple experiment, one desert diamond-back (*Crotalus atrox*) and two sidewinders (*C. cerastes*). All three snakes were of medium size and had been captured the night before (October 1) in the close vicinity. They were uninjured, healthy and very active when the experiment started.

The first specimen used, a sidewinder, was placed in full sunlight on a level stretch of sandy ground at 12:39 P.M., October 2, 1932. The temperature of the surface of the sand measured 55.5°C. The air temperature was 35.5°C. The snake immediately headed for the shade of our camp and very actively attempted to reach it by the typical looping movements. The animal was constantly shoved back with the aid of a small rake, our snake collecting instrument. While for the first few minutes its vigorous movements showed no effect of the insolation, they slowed down quite suddenly at 12:44. At 12:45, six minutes after the beginning of the experiment, the snake was stretched out, apparently unable to move by "sidewinding." It made futile attempts to move by uncoordinated caterpillar movements and weak wriggling. At 12:46½ movement stopped altogether and mechanical stimuli brought no response. The snake appeared dead. A thermometer inserted into the cloaca and pushed up into the intestine for about 6 cms. read 47.0°C.

The second sidewinder was placed on the sand at 12:54 P.M. It died at 1:03 P.M. Its body temperature measured 47°. The diamond-back was exposed to sunlight at 1:49 P.M. At 1:58 all movements had stopped, the snake did not react to mechanical punishment and seemed dead. At 1:59½ the snake opened its mouth and advanced the fangs with a vibrating motion; at the same time the pupil widened. Its body temperature was 46.5°.

Autopsy of all three specimens showed healthy, obviously unaltered internal organs. The ventricle of the heart was fully contracted and absolutely empty, while the atria and large veins were filled with blood and widely distended. The lungs seemed rather strongly suffused with blood.

Summarizing the observations of the three specimens, we can state that *Crotalus atrox* and *Crotalus cerastes* are killed by exposure to the desert sunlight within 7-10 minutes. While the first minutes show no great change, the snakes moving towards the shade, grave symptoms appear rapidly in the last minutes before death. During this time the snakes are stretched out fully or almost so, breathing heavily and attempting caterpillar motion. The mouth is opened and closed with a yawning motion, the fangs advanced. Movements in the head region (tongue, fangs) can be observed after the last convulsive wriggling of the body has stopped. The widening of the pupil may be taken as the conclusive sign of death. Rigor mortis sets in almost immediately, is very distinct, and travels from the head tailwards.

The most significant observation seems to be the almost identical body temperature in all specimens just after death. Apparently the snake's body cannot withstand a temperature above 46°C, and the death is caused by overheating. Further experiments are intended to throw more light on this subject.

It is interesting to note the extreme sensitivity to sunlight of these nocturnal desert reptiles which so sharply contrasts with the tolerance of certain diurnal reptiles, such as *Uma notata*, which, in exactly the same habitat, plays and thrives on sand at 55°-60° C.—WALTER MOSAUER and EDGAR L. LAZIER, *Department of Biological Sciences, University of California at Los Angeles, California.*

DEATH OF A RATTLESNAKE FROM CONTINUED EXPOSURE TO DIRECT SUNLIGHT.—A Pacific rattlesnake (*Crotalus c. oreganus* Holbrook) was killed by exposure to full sunlight in twenty minutes on August 15, 1932, near Bucks Lake, in Plumas County, California. The altitude there is 5000 feet, the exposure southwest, and the day was clear, quiet, and warm. The snake was fourteen inches long and had four rattles.

The following observations were made:

10:55 A.M.	Snake placed in full sunlight in a depression 1½ feet deep and 3 feet wide in granite sand.
11:05	Made determined effort to escape, much more so than in earlier minutes.
11:05-11:06	Snake shaded with hat; it immediately became quieter and assumed the coiled position.
11:10	Movements slower, apparently weakened, crawled to side of hole, straightened out and rolled over; this was repeated eight times.
11:13	Apparently very much in distress, body bent abruptly, movements not organized or coordinated.
11:14	Very much in distress, rolled over, held mouth completely open for 30 seconds.
11:15	Dead.

LLOYD W. SWIFT, *U. S. Forest Service, Quincy, California.*

NOTE ON THE KILLING OF RATTLESNAKES BY "SUNLIGHT."—Reports of the killing of rattlesnakes by short periods of exposure to direct sunlight (circa. ten minutes) are frequent and well authenticated, although such reports are often met with doubt.[1] The question arises as to whether this lethal effect is due to the raising of the snake's temperature to a point incompatible with life, or to the results of some photochemical reaction involving a definite region of the solar spectrum as in the case of *Eisenia foetida*.[2]

To test this point the writers exposed a medium sized Pacific rattlesnake (*Crotalus confluentus oreganus*) to various types of radiation. The animal was irradiated in a large tinned cylinder, 30 cm. in diameter and 35 cm. deep. A relative measure of the total radiation was obtained by means of a blackened thermometer bulb placed at the bottom of the cylinder; this should give a rough measure of the radiation reaching the animal. The experiments were as follows:

I. On August 14, 1932, the snake was exposed to light from a 200 W. tungsten filament lamp at a distance of 45 cm., through a thin plate of window glass. This source provides radiation extending from approximately 4000°A into the infra-red with a maximum in the near infra-red. The exposure was continued for 30 minutes, the only apparent results being an increase in the activity of the snake as the thermometer rose from 25° to 36°C. The behavior of the animal was apparently normal during the succeeding days, with no indication of injurious effects from the treatment.

II. On August 18, the animal was exposed for 11 minutes to the radiation from a quartz mercury arc (220 V. Cooper Hewitt lamp operating on a line voltage of 110 V.) at 45 cm. This radiation is rich in the ultra-violet wave lengths which are ordinarily destructive to living tissues (i. e., below about 3000°A) and will produce an erythema in human skin following an exposure of a few minutes. It is thus more intense in the biologically active region than is sunlight. No effect was observed whatsoever. The thermometer rose only from 23° to 25.5° C. during the period of irradiation. The snake remained quiet throughout the entire period. No injurious effects were manifest in the twenty-four hours following this exposure.

III. On August 19, the snake was exposed directly to a clear noon sunlight in Berkeley for 17 minutes. The thermometer reading rose from 23° to 36° C. during the exposure, and the activity of the snake increased with the increase in temperature

[1] Grinnell (*Univ. Calif. Publ. Zool.*, 5, 1908: 165-6, pl. 20) reports the killing of a gopher snake, *Pituophis catenifer*, with photographs of the animal before and after exposure.

[2] See Hausmann, W., *Grundzüge der Lichtbiologie u. Lichtpathologie*, Berlin, 1923: 171.

much as in Experiment I. There were no injurious effects manifest following this treatment.

These experiments would indicate that no definite part of the spectrum is injurious to the rattlesnake, as would be the case if the lethal process involved a photochemical reaction, since ultra-violet radiation considerably more intense than that of sunlight, and intense visible radiation are without effect. Furthermore, Berkeley sunlight was not lethal under our conditions of irradiation, which would afford a greater intensity of incident light than exposure on an earth surface, since the reflecting tinned cylinder served as a light well. Those instances of killing of rattlesnakes by exposure to the sun which have come to the notice of the writers have all occurred in desert or interior regions where the sunlight is very intense and the immediate environment (e. g., the earth on which the animal rests) may reach considerable temperatures. It therefore seems probable that the lethal effect in such cases is due to the raising of the temperature of the animal by the combined effect of the absorption of solar radiation and conduction of heat from the environment. To test this possibility, on August 20 our snake was placed in an air bath, the temperature of which was raised by means of a hot water jacket. During a period of 14 minutes, at the end of which the snake was dead, the temperature rose from 38° to 52° C. As soon as introduced into the air bath, the snake began to move rapidly about. At the end of 7 minutes, when the temperature of the bath had reached 49° C. the snake was making undirected writhing motions, and gasping. Shortly after it ceased to move and became rigid. The animal was probably dead some time before it was removed from the bath at the end of 14 minutes, at which time it could not be stimulated to movement, and the muscles appeared to be in rigor. The rigor was still present after 24 hours. The cause of death must be conceded to be the result of irreversible changes in the tissues produced by excessive temperature; heat rigor occurs in cold blooded muscles in general above 40° C.

The manner of death tallies with Grinnell's description for the killing of a gopher snake by sunlight,[1] and with descriptions of the killing of rattlesnakes under similar conditions which have been communicated to the writers by Mr. W. B. Hotchkiss and Mr. S. B. Benson. The temperature at which our animal died (about 122° F.) is probably often exceeded by surface earth temperatures in desert and interior regions. It seems, therefore, unnecessary to assume any combined effect of a photochemical reaction with temperature, but rather that, in such instances as the above, death is due solely to the effects of excessive temperature.—H. F. Blum and C. R. Spealman, *Division of Physiology, University of California Medical School, Berkeley, California.*

THE PROBABLE SIZE MAXIMUM OF *CHRYSEMYS PICTA PICTA* (SCHNEIDER).—An unusually large female painted turtle was taken on Croton Point, New York, on July 6, 1932 (C.R.D.S.). Its measurements, made with steel rule and calipers, follow for the straight lengths and the greatest straight widths: Carapace, 7 x 5½ inches; plastron, 6¾ x 4¼ inches; tip of snout to end of tail, 11 inches.

With the possible exception of one other record noted below this seems to be the maximum for the species and is larger than records found in the available literature.

It is rather remarkable how definite this maximum length seems to be, as evidenced by measurements of large painted turtles at Mastic, Long Island, from 1915 to date (J.T.N.).

June 12, 1915	Carapace —	Plastron 6½ inches
June 26, 1920	Carapace 7⅛	Plastron 6¾ inches
May 30, 1921	Carapace 7	Plastron 6½ inches
June 25, 1922	Carapace 7	Plastron 6¼ inches
June 9, 1929	Carapace 7 (approx.)	Plastron 6⅛ inches

John T. Nichols and C. Ralph De Sola, *American Museum of Natural History, New York City.*

[1] *Loc. cit.*

Reviews and Comments

BOOKS FROM AND ABOUT THE ZOOS AND AQUARIA.—There have recently appeared from the press, in England and America, a number of books from and about the zoos and aquaria. Some of these may be briefly noted here:

Thrills of a Naturalist's Quest. By Raymond L. Ditmars. New York. The Macmillan Co. 1932. xii+268 pp., 46 figs.—This book, which makes interesting reading for anyone inclined toward natural history, starts with a bit of autobiography. Dr. Ditmars tells us of his early experiences and feelings as an embryo naturalist, of his work as assistant in entomology at the American Museum, of his first scientific paper, and of his first reptile collection in his parent's home, finally of his more mature experiences as keeper of reptiles and later of mammals in the New York Zoological Park. Throughout the work are inserted bits of interesting natural history. Thus the author tells the story of the seventeen-year locust along with the recollections of his early Museum work. His experiences with snakes, especially the poisonous ones, are particularly recited. The later chapters, devoted to experiences with zoo mammals, are, like the earlier ones, mostly illustrated by fine photographs taken at the Zoological Park. The stories are told as they would be in interesting conversation.

The Zoo and Aquarium Book. By E. G. Boulenger. Duckworth. London. 1932. 384 pp., 57 figs.—This well-written book is a combination of The Aquarium Book (1925) and A Naturalist at the Zoo (1926). It is charmingly illustrated by a number of L. R. Brightwell's inimitable sketches. The aquarium part is introduced by a popular explanation of how public and private aquaria are constructed and maintained. The sea-water aquarium section has chapters on invertebrates, fishes and reptiles, each including natural history notes of interest on such animals as are or may be maintained in aquaria. The fresh-water aquarium section similarly treats invertebrates, fishes and aquatic batrachians. The second part, A Naturalist in the Zoo, naturally treats mammals at greatest length, but has a short chapter each on snakes, lizards and frogs and toads.

Guide to the John G. Shedd Aquarium. By Walter H. Chute, Director. 1933. 220 pp., numerous illustrations, some colored. 50 cents, postage extra.—This splendid guide book surpasses in size and appearance other guide books, just as the Shedd Aquarium overshadows the other large public aquaria of the country. A short description of the aquarium is followed by a list of 827 species of marine and freshwater fishes of aquarium interest. For nearly all of these species some little natural history note is given, including interesting aquarium observations. The prominent denizens of the charming Balanced Aquarium Room are then treated in a short chapter, following which are descriptions of Other Exhibits—Reptiles and Batrachians, Invertebrates, and Mammals. An index closes the volume. The illustrations are consistently interesting, as well as scientifically valuable.

Tropical Aquarium Fishes How to Breed and Rear Them. New York. Frederick A. Stokes Co. No date indicated. 128 pp., 23 figs.—This is just another aquarium book written by a very enthusiastic fancier. It includes the usual sections on aquarium culture, on aquarium plants and molluscs, foods and feeding, diseases, and aquarium appliances. The "General Survey of Tropical Aquarium Fishes" was appropriated bodily from George Myers' "The Aquarium and its Denizens" (with brief acknowledgement but, we understand, without the author's permission). A few "Representative Tropical Fishes" are then discussed at greater length by the author himself.

Tropical Fish for the Home Their Care and Propagation. By F. H. Stoye. New York. Empire Tropical Fish Import Company Publishers. No date given. 215 pp., 3 figures of food organisms, 6 figures of fish enemies, 8 plates and 11 figures of plants and 165 plates of fishes, some colored.—This is a much better tropical fish book, perhaps the most modern and extensive available in the English language. It consists chiefly of a running list of "tropicals" with good descriptive and cultural notes. Brief

but good chapters on aquarium culture and on aquatic plants are, however, included. The nomenclature is accredited to Arthur Rachow's German standard "Handbuch der Zierfischkunde", and is quite thoroughly modernized. The very numerous illustrations, likewise of German origin, are mostly very good. The general zoologist will be surprised at the wealth of accumulated observations of aquarists, especially those on breeding habits, which are reported in this volume. The author's hope "that both the experienced breeder and novice will find this book interesting and useful" should certainly be fulfilled. He has done a good job.—CARL L. HUBBS, *Museum of Zoology, University of Michigan, Ann Arbor, Michigan.*

FISHES THEIR JOURNEYS AND MIGRATIONS. By Louis Roule. With an Introduction by William Beebe. Translated from the French by Conrad Elphinstone. W. W. Norton & Co., New York. xii+270 pp., 54 figs. $3.75.—"No novel has so much interest, no fairy tale so much charm, no work of imagination so strange a diversity as the simple story of the journeys of fishes": Such is the enthusiasm of this French ichthyologist in writing of his life-studies, the migrations of European fishes. In charming pen-pictures he portrays the journeys of the migratory fishes of Europe, treating at greatest length the trout and the salmon; the shad, herring and sardine; the mackerel and tuna; the cod; the golden perch, and finally the eel. Treating thus the migrations from the simple to the more complex, he unfolds for the general reader the apparent mystery of the great fish movements. From a literary viewpoint the treatise is strengthened by being confined to relatively few species, of which the author writes intimately as a result of his own personal researches. Students of fishes will however regret that more species are not discussed, while American readers will be disappointed that the account is confined to the European species. Thus in devoting four chapters to the Atlantic salmon, no mention is made of the still more wonderful migrations of the Pacific salmon.

The author (and translator) have indeed told the story of fish movements in such clear and dramatic style as to make their work a fine piece of popular biological literature. This is particularly true of the several chapters with which the word "wedding" is connected. Some of these passages even rival the writings of Dr. Roule's countryman, Guy de Maupassant. Though in discussing the migrations proper the author takes pains to point out the dangers and untruthfulness of an anthropocentric viewpoint, he pictures the breeding habits which consummate the migrations as though the ardors were consciously enjoyed. The description of the spawning of the trout partakes more of romance than of accuracy in details. Thus the author has the eggs scattered over the bottom, and fertilized after the females leave the redd, the female attracted to the male by his bright colors,—and other actions which are contrary to easily observed fact. Such inaccuracies are not common, unless one includes with them the occasional exaggerations which the author has allowed his enthusiasm to produce, such as the statement that no other fish is so perfectly stream-lined as the salmon.

The author not only proposes but reiterates over and again, as though it were thoroughly proven, his own theory that the maturing salmon and trout move upstream because, needing more oxygen, they move in the direction of the higher oxygen tension. This theory, which calls for critical testing in other regions, is more plausible than another theory introduced to explain the downward migration of the smolt, namely that they drop into deeper water to shun the light, because they have become invested in silver. This theory is diametrically opposed to the evidence that the guanin which produces the silvery color is a fine light and heat insulator, that such colors as those of the smolt are characteristic in general of pelagic fishes, which are most exposed to light, and that the smolt in migrating downstream presumably is subjected to increased illumination because it forsakes its "hides" along the banks. The reasoning that the salmon must live at great depths in the sea because its red flesh indicates a diet on the red shrimp living in that habitat, is similarly indefensible, because many landlocked races of salmon and trout develop red flesh in association with a diet of non-red crustaceans or molluscs. This false reasoning, along with the fishermen's failure to capture the growing salmon in what is presumably their pelagic habitat, has led the author into a beautiful imaginative fantasy of the life of these salmon amid the giant corals on the bottom of the great depths along the continental shelf, where he has them in due time feel the currents from the home rivers!

Fortunately these flights of imagination are not indulged in very often by the author. The book contains a large store of authentic information, presented in a fascinating style. It will be enjoyed by ichthyologists and other naturalists as well as by the general public.—CARL L. HUBBS, *University of Michigan, Ann Arbor, Michigan.*

FRESHWATER FISHES OF THE U.S.S.R. AND THE BORDERING COUNTRIES. By L. S. Berg. 3rd corrected and enlarged edition, Pt. 1., Leningrad. 1932. (Russian text) 543 pp. 474 text figures.—The first edition of this book appeared in 1916, the second in 1923. The present third edition was so much enlarged that it had to form two parts. The volume reviewed, Part 1, includes the description of nine families: Petromyzonidae, Acipenseridae, Clupeidae, Salmonidae, Thymallidae, Osmeridae, Salangidae, Catostomidae and Cyprinidae. All other families are to be included in Part 2, in which will be about 300 pages and 200 figures and a map. It is announced to appear during 1933.

The introduction contains a short osteology of fishes, explanation of the system used, of taxonomic units, of principles of scientific nomenclature, glossary and abbreviations used, and an artificial key for determining families.

In the second, one-volume, edition of 1923 the description of families named above occupied only 311 pages, while in the third it occupies 543 pages. As the author explains in the introduction to the present edition, it includes a description of 315 species and 148 subspecies (instead of 283 species and 95 subspecies described in the second edition),—all freshwater fishes of the basins of the Glacial Ocean in Europe and Asia, of the Pacific Ocean from Bering Sea to the Korea boundary, of the Balkash and Aral seas, of the rivers of Turkomenia and the Caspian, Black and Baltic seas. The only exception is some West European coregonids, the systematics of which is not yet fully worked out.

Thus, according to the assertion of the author, his book might be used for determining freshwater fishes of almost the whole of Europe (with the exception of Mediterranean countries) and all of northern Asia, which comprise altogether over 25 millions of square miles, more than the surface of North America. The enlargement of the text depended principally upon the more abundant information about the biology of commercial fishes.

The principal aim of the book was to give a short textbook for determining freshwater fishes of Soviet Russia. For this reason it is supplied with many keys for the genera and species, sometimes separate for certain basins, and with very numerous and well executed figures, not only of fishes themselves but also of structures important for determining the species (teeth, scales, gill-rakers, etc.).

The descriptions are accompanied by references to the original descriptions, by the most important synonyms, by a statement as to the maximum size, by very detailed biological data on spawning, rate of growth, etc. In many instances original figures of fry and young fishes are given.

The author recognizes, in addition to species and subspecies, some additional lower taxonomic units; race, morpha, natio (the natio will be subspecies), and in many cases hybrids between two species. He objects strongly (and, I should say, rightly) to the changes of the long-adopted and known generic names on the ground of priority. According to his opinion, there is no immutable law, but there are regulations which must be used in reasonable limits. "The regulation of priority must not be pushed to the absurdum as it is done not rarely (especially in American literature)", says the author (p. 17).

When completed by the expected Part 2 this voluminous work on the freshwater fishes of U.S.S.R. and bordering countries will present one of the indispensable reference books for ichthyologists working on the freshwater fishes of European, North Asiatic, and North American countries. Though written in a language with which not every scientist is familiar, thanks to the fact that at the present time in some American universities there are Russian professors, lecturers of Russian language and literature, Russian scientists and students, it will be possible, with their help, to use this very valuable and well done ichthyological work by Professor L. S. Berg.—N. BORODIN, *Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts.*

EDITORIAL NOTES AND NEWS

Bureau of Fisheries

IT is reported in *Science* for August 25 that:

"Appropriations and allotments for the Bureau of Fisheries investigations during the fiscal year 1934 have been reduced in the total amount of $170,000, or 42 per cent., over funds provided for such work during the fiscal year 1933. Owing to the fact that reductions in field activities and the exercise of every possible economy had been effected through reduction of appropriations in the previous year, these further cuts necessitate the reduction of permanent personnel. From a total of fifty-two fishery investigators and assistants, ten positions have been dropped. Those affected by separation from the service on June 30, 1933 are: Henry M. Bearse, junior aquatic biologist; Louella E. Cable, junior aquatic biologist; Arthur A. Dallas, junior biological aid; Harvey C. McMillan, junior aquatic biologist; Virgin W. Matlack, clerk; Dr. Vera Koehring, associate aquatic biologist; Marie A. Donovan, clerk; Dr. Stillman Wright, assistant aquatic biologist; Francis L. Widerstrom, junior biological aid, and Dr. Abraham H. Wiebe, associate aquatic biologist. All these have had service with the bureau from one to nine years."

Dr. STILLMAN WRIGHT, former limnologist of the U. S. Bureau of Fisheries, one of several skilled investigators lost from the service because of the needs of economy, sailed from New York for Rio de Janeiro on August 19 to join the Brazilian government in a study of fish farming possibilities in the numerous artificial lakes and reservoirs in northeastern Brazil. Northeastern Brazil is a semi-arid region subject to periodical droughts of great severity. In order to provide an adequate supply of water for irrigation during the dry periods the Brazilian government has dammed a considerable number of the streams, and is now making a biological survey of the reservoirs thus provided to determine their suitability for fishes.

Ichthyological Expeditions

DR. WILLIAM BEEBE, of the New York Zoological Society, has returned from a five weeks' trip on the yacht *Antares*, surveying the possibilities of ichthyological study in the Pearl Islands and Chiriqui Lagoon. Together with the staff of the department of tropical research, he sailed on August 16 for Bermuda to continue ecological work on shallow and deep-water fish.

Dr. ALBERT W. C. T. HERRE, curator of the Zoological Museum, Stanford University, sails on September 11 for Yap, in pursuance of his studies of the geographical distribution of fishes in the tropical Pacific. The Pelews will next be visited, and further explorations made in the Philippines. Two or three months will be spent at Ling Nan University, Canton, in continuation of his investigations of the fishes of southeastern China. The return trip will be made *via* Singapore, Colombo, Mombasa, Zanzibar, Durban, Cape Town, Buenos Ayres, Rio de Janeiro and the Panama Canal.—From *Science*.

From the Indian *Current Science* we learn of the John Murray Oceanographical Expedition, the field of which is the exploration of the Arabian Sea from the Persian Gulf down to the level of Madagascar and east to west between India and Africa. Especial attention is directed to the zonation of the fauna on the continental slopes between 50 and 1000 fathoms.

California Fisheries Work

MEMBERS of the Society will be gratified to hear that the California State Fisheries Laboratory on Terminal Island, adjacent to Long Beach, was not at all injured by the great earthquake of last March, and that the entire staff escaped injury. The Laboratory has also survived something of a political upheaval. Dr. FRANCES N. CLARK has returned to her position in the Laboratory.

Fish Work At Michigan

A NUMBER of ichthyological researches have been undertaken at the University of Michigan this summer. Prof. YUANTING T. CHU is concluding his studies of the taxonomy of Chinese Cyprinidae; KATSUZO KURONUMA has arrived from Japan to assist Dr. CARL L. HUBBS in his studies of Japanese fishes; Prof. LEONARD P. SCHULTZ and ARTHUR WELANDER, from the University of Washington, worked on Alaskan fishes; MOTT DWIGHT CANNON is revising certain genera of darters; Dr. Hubbs is also writing reports on freshwater fishes of Middle America and North America. A number of other investigations, in the field of economic ichthyology, are being continued by the staffs of the Great Lakes Laboratory of the Bureau of Fisheries, and of the Institute for Fisheries Research.

News of Russian Ichthyologists

THE well-known Russian ichthyologist PETER J. SCHMIDT celebrated the 40th anniversary of his scientific work on March 25. He is now engaged in directing the second summer's exploration of far eastern waters, following the work of 1932 mentioned in the last number of COPEIA.

Dr. G. LINDBERG, Curator of Fishes in the Museum of Zoology of the Academy of Sciences of the U.S.S.R., spent the summer collecting fishes at Kirkisia. He returned to Leningrad about September.

Dr. A. M. POPOV has been appointed Professor of Vertebrate Zoology in the State University of Perm, and also Curator of the Biological Research Institute at Perm and Director of the Biological Station on the Kama River.

Recent Deaths

THE Editors have just learned of the death, last year, of Dr. F. G. MASKELL, of the Zoology Department of Victoria University, New Zealand. Dr. Maskell is best known to ichthyologists for his excellent work on the life history, biology and physiology of the New Zealand lamprey.

We learn from the May issue of *Current Science* of the death, early this year, of Lt.-Col. A. W. Alcock, formerly Superintendent of the Indian Museum, and well known for his description of the deep-sea fishes collected by the *Investigator*, though his chief work was perhaps on insects and medical entomology and on marine invertebrates. Alcock was born in 1859, and served in various medical and scientific positions in India from 1886 to 1907.

Abstracts of Fisheries Literature

IN June a conference of several ecologists and fisheries workers was held at the University of Chicago, with Prof. J. R. SCHRAMM, Editor of Biological Abstracts, to perfect plans to provide fishery workers in America with adequate abstracting of the literature in the field of fishery biology. It was tentatively decided to establish a separate heading on Fishery Biology and Aquiculture in Biological Abstracts, though abstracts of hydrobiology papers will probably continue to be classed under Ecology.

News Items

KARL P. SCHMIDT, assistant curator of reptiles at the Field Museum of Natural History, will leave for Guatemala in November, to continue his investigations on the distribution of reptiles and amphibians in that area under a fellowship of the John Simon Guggenheim Memorial Foundation of New York.

C. RALPH DE SOLA and wife (formerly Frederica Abrams) spent the summer on Monhegan Island, Maine, where Mr. De Sola conducted informal parties and discussions on oceanography and ichthyology.